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VIEWS, NEWS AND INTERVIEWS.

Meekin, the lazy inventor, ambled slowly into the ELECTRICAL REVIEW office one day last week, helped himself to a chair, cocked his feet upon a steam radiator and lighted his pipe. After a while, when he found no one was paying any attention to him, Meekin began to talk.

"In the electrical business," he remarked between puffs at his pipe, "there are many generous people; in fact, most of them are too generous for their own good. But I've found a freak—a mean man in the electrical trade. His name is—well, say Smith. I see him often, and here's what I saw the other day: It seems that Smith's business requires him to take a ferry to Jersey nearly every day about noon. He's in the habit of buying a sandwich in the ferry-house on the Jersey side. This sandwich he carries on the train and eats it while he's going out to where his business calls him. This ferry-house sandwich constitutes Smith's lunch.

"Well, Smith had been giving up 10 cents a day to the Jersey sandwich man for some time when one day I happened to overhear this confab:

"'Say,' says Smith, 'what'll you charge for these sandwiches in quantities?'

"'What's the matter?' says the sandwich man. 'Goin' to have a wedding up to your house?'

"'No wedding,' says Smith; 'I want 'em for my own use.'

"'About how many kin you use?' says the sandwich man.

"'What's your price on 1,000?' says Smith.

"'Oh, I s'pose, if you took 1,000, I could let you have 'em for about five cents apiece,' says the sandwich man.

"'All right,' says Smith, laying down five cents; 'I'll take one now and one a day as I pass through here till the thousand are used up.'"

"Every man has his price," sententiously announced the philosopher of the all-night drug store where the street railroad franchise was being discussed.

"Well," said the wit of the establishment, "I wish somebody would discover my price and offer it to me."

"My boy," solemnly remarked the perfumery drummer, who had not spoken before that evening, "there is no smaller coin made than a cent."

And for several seconds there was no sound heard save the drip, drip of the real mineral waters from the hydrant.—*Buffalo Express.*

Mr. B. E. Greene, of the Greater New York, was formerly connected with electrical journalism, and consequently is pretty well known among electrical people. His friends will appreciate this anecdote for which he himself is responsible. Mr. Greene is a practical printer, and as such has run the gamut from compositor on a country weekly to editor of an electrical paper—or *vice versa*, as you please. In his earlier days he got a job on a little paper in Watkin's Glen, N. Y., as compositor at $9 per week. For two weeks he "stuck type" at the case but saw nothing of anything in the way of salary. Finally, on the second Saturday afternoon, when a big batch of "rush" job work had come in, Greene tackled the proprietor for a little of the necessary.

"See here, Major," remarked Greene, "I've been working for you for two weeks and I haven't received a cent of salary. I've got a board bill to pay and I want some money."

"That's all right," said the Major, "I'm going downtown now for it. You wait here till I come back."

Late that afternoon the Major returned. He had with him a beautiful "jag," which was rapidly becoming unmanageable. Greene reminded him of the salary question.

"By heavens, old man," replied the Major, embracing Greene, "I've worked har—hic—hard f'r you to-day. Be—hic—been downtown a—hic—all af'rnoon playin' pool tryin' to win tha—hic—that $18 f'r you. I got three—hic—three dollars f'r you an' here 'tis."

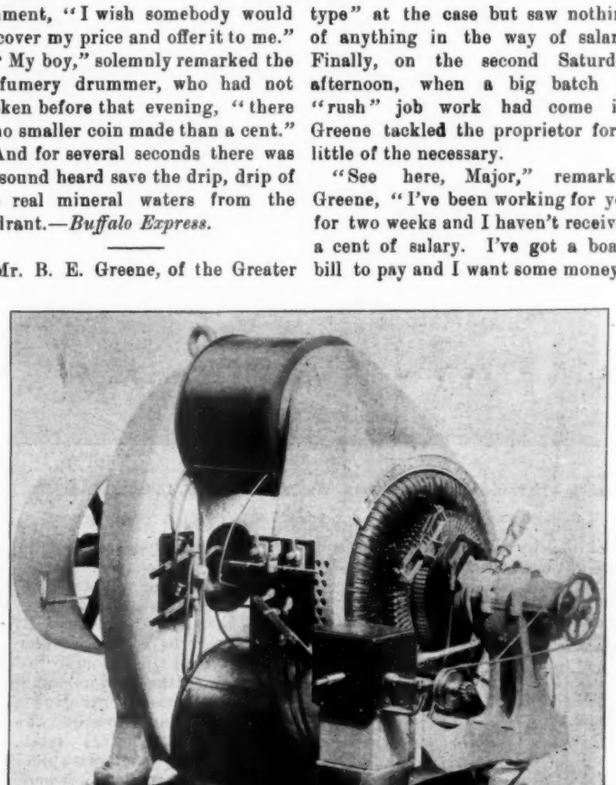


FIG. 1.—IRONCLAD ARC DYNAMO, MADE BY THE WESTERN ELECTRIC COMPANY.

Western Electric Ironclad Arc Dynamos.

Realizing that the ironclad armature has almost completely driven the surface-wound machine from the market in constant-potential work, the Western Electric Company has designed and put in service a complete line of arc machines having ironclad armatures and other new features.

These ironclad armatures have been in use in increasing numbers for over a year without the loss of a single coil. This is a practical demonstration of the possibility of insulating an ironclad armature for high voltages; and once having accomplished that task, the mechanical superiority of the ironclad armature is unquestionable. The man who has spent twice as much time in replacing the bands on a burned-out armature as he has in rewinding a burnt coil will appreciate an armature in which the knocking out of a wedge gives complete access to a coil.

The general form of construction of these machines is shown in Fig. 1. The frames are of the bipolar horseshoe type, with the magnets horizontal. The magnet cores are of wrought-iron and the pole-pieces and yoke are of cast-iron.

The pole-pieces are divided in the center, thereby greatly reducing the cross-magnetizing action of the armature. The pole-pieces are so shaped that when the regulator is set to give an absolutely constant current at any load the field will be of the right strength to give the predetermined slight amount of sparking in whatever position the brushes may be set.

The bearings are of the self-oiling, self-aligning type, and are provided with visual oil gauge and drain. The pulley-end bearing is bolted directly to the yoke of the dynamo and the commutator-end bearing rests on a brass bracket projecting from the lower pole-piece. The bearing bracket is bored out at the same time the pole-pieces are bored, so that the removal of the armature is a very simple matter. The bolt can be taken out and the bearing turned around the shaft until the foot is clear of its seat, and the armature will then rest in the pole-pieces, and the bearing can be slid off with a very slight exertion.

The simple fact that the armature may be so easily and quickly removed for examination or repairs is a point that is fully appreciated by all central station managers. The bearing may be removed in about five minutes, the pulley in three and the commutator in ten. It may be remarked

here that the time occupied by one man and helper in winding an armature coil is, on the average, 50 minutes for an 80-light machine, which is about an average size. The bearing seat affords a very convenient place in which to rest the armature, thereby doing away with the necessity of removing the armature completely from the frame.

The most vital part in all dynamos of high potential is the armature. If the armature is not thoroughly insulated and designed for comparatively cool running, the machine is destined to a short life.

The care taken in procuring first-class insulation of the armature is shown in Figs. 2 and 3, which can readily be understood by reference to the following description:

The armature is built up of very thin sheet-iron rings mounted on a brass spider. The sheet-iron rings have teeth similar to those in the standard incandescent ironclad armature; the coils are wound in the slots between the teeth and are firmly held in place by wooden wedges, which are driven in over the top of the winding. The armatures are divided into a very large number of coils of comparatively few turns of wire. In this way the voltage in the individual coils is reduced to such a small amount that there is very little strain on the insulation between coils, and the voltage between segments of the commutator is so low that it is difficult to flash the machines under ordinary running conditions; and if flashing does occur, the effect on the commutator is scarcely noticeable. By dividing the winding into a large number of small ventilated coils the accumulation of heat in the center of the coils is avoided, thereby preventing the slow roasting of the insulation, which occurs in some machines.

The coils are insulated from the core in the slots by a trough which is built up of alternate layers of press board, mica and oiled paper, the sheets of mica being well lapped to avoid any chance of puncturing at the joints. The coils on the inside of the armature are wound in insulating troughs somewhat similar to the troughs in the slots, with the exception that they are narrower and deeper. The ends of the coils are insulated from the core—first, by wooden rings which are placed at the ends of the armature and form rounded corners to wind over, as well as affording additional insulation; second, by built-up "U"-shaped troughs which overlap and extend in and around the inside and outside troughs, so that the result is that each coil is wound in a separate trough built up of four overlapping troughs, which effectually insulate it from each of the other coils and from the core. A complete trough is shown separate from the armature in Fig. 3.

The advantage of this form of construction is at once evident in case repairs become necessary, as any coil can be rewound without affecting the others in any way; and as there are no bands, all that has to be done is to slip the armature far enough out of the pole-pieces to work on it, and then take off the commutator and rewind a coil and put the armature and commutator in place again.

The 100 and 125-light armatures have a large space between the inside of the armature and the spider. On the 80-light and smaller machines the construction of the brass spider is such that the shaft and the greater part of the hub and spider can be taken out from the inside of the armature, so that there is a great amount of space on the inside of the armature and the facility for winding is very greatly increased. The inside and outside parts of the armature spider are drawn into perfect alignment again by six bolts with taper collars, as shown in Fig. 2.

In case one or even four or five coils of an armature become injured, it is not necessary to rewind them at once, for, if a coil is not short-circuited internally, the terminals of the coil can be simply disconnected from the clamp on the commutator and a small jumper put across the same segments to which the coil was previously connected, and the machine can be run with no serious increase of sparking.

If any of the injured coils are short-circuited internally, of course the short circuit must be gotten out, or the whole coil may be cut out with a cold-chisel. If this is done, it is necessary to take out the opposite coil also, in order to keep the armature in running balance. A wooden wedge inserted in the place of the inner portion of the coil will serve to hold the other coils in place.

The following table shows the result of a test made on an 80-light machine, in which armature coils were cut out at various points:

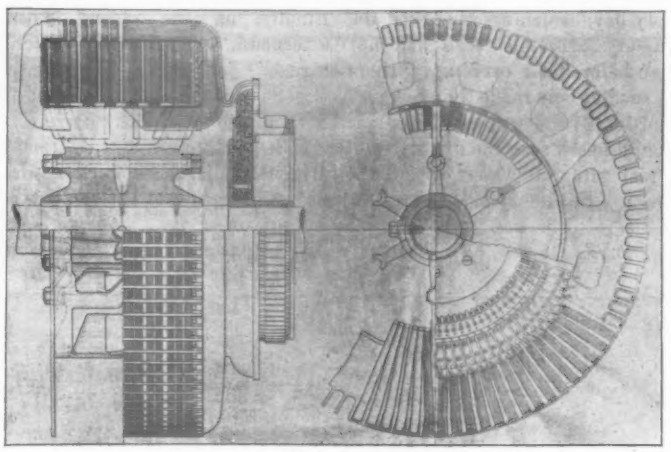


FIG. 2.—DETAILS OF CONSTRUCTION, WESTERN ELECTRIC IRONCLAD ARC DYNAMO.

Number coils cut out.	Volts.	Amperes without the use of reducing switches.	Length of spark. Inches.	Location of coils.
2	4,300	10.4	1/4	Adjacent.
3	4,250	11.4	1/4	Adjacent.
4	4,200	12	3/4	Adjacent.
8	4,000	11.4	1/4	Bunches of 2.
12	3,800	12.2	1/4	Bunches of 3.
16	3,600	10.4	1/4	4 Bunches of 2 and 8 single coils distributed around the armature.
16	3,600	13.2	3/4	Bunches of 4.

The spark is somewhat increased in length, but is not of a nature to damage the commutator.

The current may be reduced from that shown in the table to the normal amount, by the use of the reducing switches, without materially affecting the length of spark, as will be seen from the following test:

A five-hour run was made, with 16 coils cut out in four bunches of two and the other eight unequally distributed about the armature. The current was 10 amperes and gave a quarter-inch spark. At the end of the run there was no sign of undue heating and the commutator was not injured in the least.

The all-important factor producing long life in an armature, after good insulation has been secured, is that of ventilation. The many tales of woe originating from the slow roasting of insulation led the designers of these machines to take special precautions to prevent the accumulation of heat in any part of the armature, as well as to prevent the general heating. The success of the system of ventilation adopted is shown by a test in which two armatures were built just alike, except that one was wound in the usual way, and in the other the coils were ventilated, as shown in the cuts and described below. The former heated 80 degrees Fahrenheit above the air after a 12-hour run, while the latter only heated 60 degrees Fahrenheit after a 24-hour run.

The armature disks are supported by extensions on the spider. These points of support, which are about two inches wide, are directly over the spider arms, as shown in Fig. 2. Between the spider arms, in the open spaces, are laid small wooden blocks about one-quarter of an inch thick which separate the armature coils from the disks, and between every three or four coils on the inside of the armature are ventilating spaces. These ventilating spaces, which are shown very plainly in Fig. 2, open into ventilating chambers in the brass ring which carries the armature disks, and this space communicates directly with the spaces between the iron disks, which are, of course, open at the outside where the iron teeth come between the coils. By this means there is a free circulation of cool, fresh air in through the coils, coming in at the bottom and flowing up through the ventilating spaces between the armature disks and out between the armature teeth. In addition to this the brass spider arms are partially cut away where they pass through the winding at the bottom, so that there is an additional opening for the admission of fresh air into the spaces between the armature rings. The iron armature rings are held apart in bunches of about 60 by radial strips of asbestos, which, from their action as a centrifugal blower, tend to keep the fresh air flowing through the armature.

The special feature of this system of ventilation and insulation is that the entire ventilating space in the armature may be filled up with carbon or copper dust, leaving the insulation of the machine as strong to resist the breaking-down strain, due to the voltage, as it was before, for the reason that each coil is insulated independently of the rest in a trough which completely protects it.

The mechanical superiority of the ironclad armature over the surface wound is most apparent when necessity requires it to be handled, either in placing it in the dynamo or moving it about the station. It may be rolled about the floor without injurious results, as it is absolutely puncture-proof.

The field coils are wound on paper spools one-eighth of an inch to three-sixteenths of an inch thick, which are built up and flanged over outside of the one-half-inch wood veneering heads. The spools are held away from the iron core and the yoke and pole-pieces by wooden wedges, so that there is a large ventilating space all around the inside and at the ends of the spools. The construction of the spools is such that should this ventilating space become filled with dirt, the coils are still effectually insulated.

On the yoke of the machine shown in Fig. 1 is mounted a pair of reducing switches which cut out part of the field winding.

The lower switch is for the purpose of adjusting the spark at the brushes to the conditions under which the dynamo is running. When this switch is open the machine will run along without flashing under normal conditions, though the spark is in this way reduced practically to nothing. If there are sudden and great changes of load, it is desirable to have the machine run with a slightly longer spark so that it will not flash before the regulator has a chance to compensate for the change in the load; this can be accomplished by simply closing the switch.

The other reducing switch is for the purpose of reducing the current output of the dynamo so that if it is desired to run the machine part of the time at a lower current than 9.6 amperes, this switch can be closed and the regulator adjusted to the lower current. In this way considerable fuel can be saved when it is not necessary to run the lights at full brilliancy.

The commutator, which is shown in detail in Fig. 2 and complete in Fig. 6, is built up on a very substantial disk of hard wood veneering which is mounted on a brass flange. This wooden disk is then faced with mica, and each segment is screwed to it independently of the others. The segments are tapered slightly towards the inside, allowing slate wedges to be driven in between them, thereby protecting the mica facing from the action of any burning that might be caused by the flashing of the dynamos. The outside ends of the segments are held rigidly by a compound ring of mica and veneering, and each segment is held in position on this ring by a machine screw and two dowel pins. The segments are insulated from each other by air spaces, allowing both sides of each segment to be perfectly inspected and cleaned at any time when the machine is not running.

With an air-insulated commutator the burning effect of flashing and short circuits is confined almost entirely to the brushes, so that it is not necessary to turn down the commutator after bad flashing, as is the case with solid-built commutators. The carbon brushes feed down and compensate for the burning as soon as it is over. All parts of the commutator which are connected with the circuit of the machine are on the face of the wooden disk, so that there are no parts behind the commutator which have to be cleaned to keep the insulation from running down. Also, all screws used in its construction are accessible from the front. The segments are increased in size at the working part so as to provide for a long life and also to hold the flashing as much as possible in the working part of the segments.

This form of construction has the additional advantage that it is not dependent on slate or rubber or any other brittle material for its mechanical support, and yet the mechanically substantial insulation is thoroughly protected by the slate wedges from the burning action of flashing.

The brushes are arranged to cover the commutator over the entire angle spanned by them, and whatever sparking occurs, is concentrated at the tip of the brush. At the brush tip is provided a small independent brush which is automatically fed down to compensate for the increased wear due to the sparking at this point. This independent brush is so narrow that the brush angle remains practically constant, no matter how fast the brush may be worn away by sparking. The tension of all brushes, there being four to each holder, is adjusted by vulcanite handles carrying a worm screw which slips down over ratchets; by turning the rubber handle carrying the worm screw the brush tension can be adjusted accurately, and when it is desired to replace a brush the handle and brush spring can be removed entirely from the brush-holder and the carbon taken out and inspected or renewed.

In some of the older forms of carbon brush-holders used on air-insulated commutators, considerable annoyance was experienced from the noise caused by the chattering of the brushes. This has been almost entirely obviated by the construction adopted. In these brush-holders the main brushes cover several segments at once and all the brushes are urged by springs in the direction in which the commutator rotates, so there is no chance for the brushes to vibrate. With these brushes it is not necessary to oil the commutator.

The connection board has a substantial slate base on which is the line switch and lightning arrester. The lightning arrester is shown at the top of the board in Fig. 1 and consists of two carbon pencils, one connected to each side of the line, which are held horizontally and in close proximity with a grounded carbon plate midway between them. As soon as the lightning jumps across, the arc is almost instantly blown out by the field from the pole-piece of the dynamo. The arresters have been found to work very satisfactorily in long-continued and severe storms.

The operation of the machines is fully equal to that of the old surface-wound type.

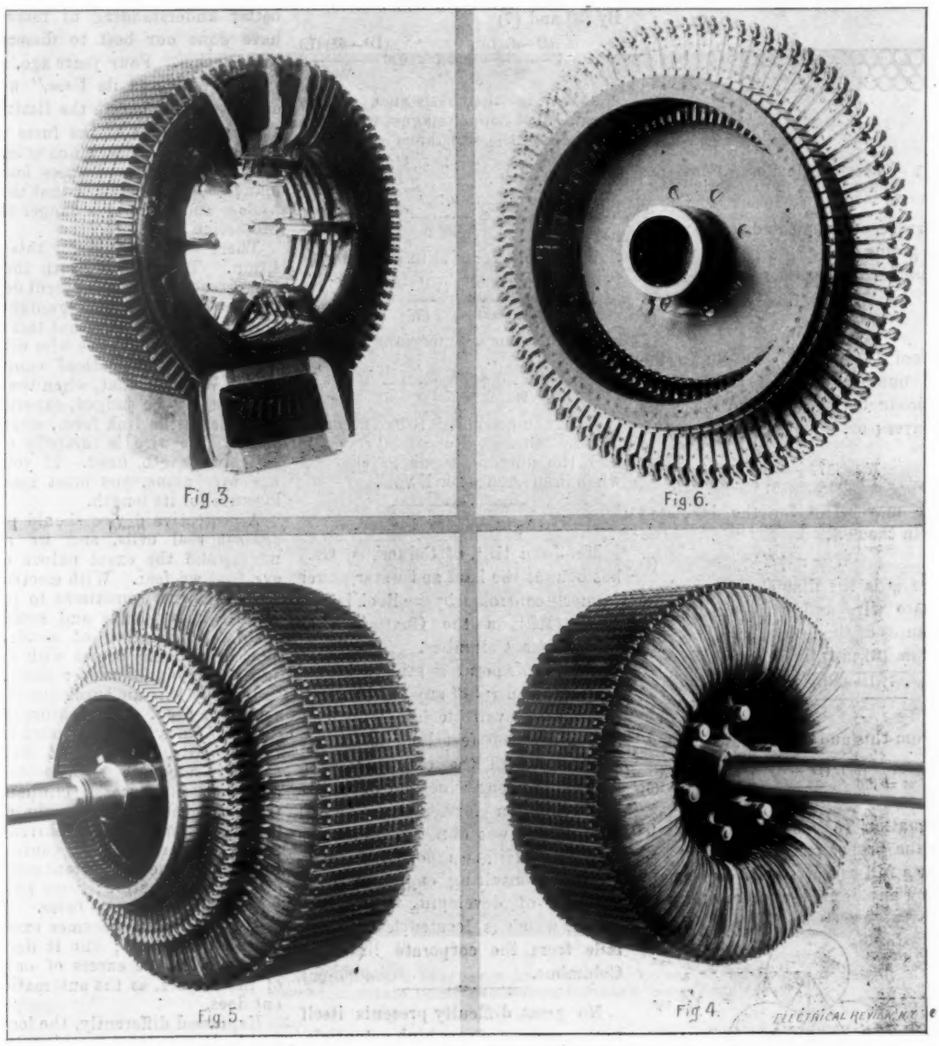
The lamps can be thrown off or on in groups equal to 10 per cent of the capacity of the machine from full load down to short circuit, or *vice versa*, and the regulator will compensate for the changes without flashing the machine; or the whole load may be thrown on or off instantly and the regulator will compensate for the change in a few seconds.

The machines withstand without injury the ordinary accidents of operation, such as open circuit and short circuit, and either side of the circuit may be grounded to the frame and the circuit opened without injuring the insulation.

A test was recently made to ascertain the rise in potential at the terminals of an 80-light machine. A load of 90 lamps on a very short line was put on the machine and the line opened as nearly instantaneously as possible at the switchboard. The potential was taken at the terminals of the machine with a Weston voltmeter. With the machine running at 4,500 volts, the voltmeter swung up to 5,500 volts; when the circuit was opened, at a load of 3,300 volts, the needle swung to 4,400. This shows that there is no marked difference between the ironclad and surface-wound machines in this respect.

If the circuit had been opened in the middle of a long line the rise in voltage and consequent strain on the insulation would have been so small as to be hardly worth figuring on.

The machines are all designed to run 14 hours on any load, from dead short circuit to full-rated capacity, without heating in any part more than 70 degrees Fahrenheit above the surrounding air.



FIGS. 3-6.—SHOWING CONSTRUCTION OF ARMATURE AND COMMUTATOR, WESTERN ELECTRIC IRONCLAD ARC DYNAMO.

The Western Electric Company manufactures this type of dynamo for 50, 60, 80, 100 and 125-light capacity, and is also prepared to furnish these sizes for direct connection to the standard high-speed engines.

Platinum in New South Wales.

It is reported that extensive deposits of platinum have been discovered at Fitfield in New South Wales. One bed of platiniferous lead ore is a mile long and from 60 to 150 feet wide. The crude metal contains about 75 per cent of platinum and sells on the field for $6 an ounce.

FOREIGN NOTES.

It is proposed to celebrate with a jubilee the fiftieth anniversary of Lord Kelvin's occupancy of the chair of natural philosophy in Glasgow University, which will soon occur.

In connection with X-ray experiments a London contemporary notes a "wrinkle" which may be of value to American experimenters. It is that wherever possible a series of short exposures should be given instead of a long continuous one, as the glass opposite the cathode becomes very hot under the action of the discharge, and there is great danger of destroying the tube. The succession of short discharges gives time for the tube to cool.

Prof. Puluj, of the Technical High School at Prague, has, according to our London namesake, succeeded, with the help of a professional photographer, in producing some very fine Roentgen photographs. These were not merely so-called "shadowgraphs," but showed in finest detail the variations in density and thickness of the objects subjected to the action of the Roentgen rays. Feathers and quills having proved very transparent, it was found possible to photograph the bony skeleton and soft parts of a bird through the feathers. The fins and bones of a sprat also came out very distinctly.

A Batch of Messages.

[*From the Journal of the Telegraph.*]

At 6 P. M., January 5, the New York *World* filed with the Western Union Telegraph Company, at New York, 3,698 messages addressed to that number of national banks throughout the United States. By midnight they had all been transmitted, and by noon of the following day answers to most of them were received and delivered.

At 6 P. M., January 10, the same paper filed with the Western Union Telegraph Company, at New York, 6,672 messages addressed to that number of State banks, savings banks, trust companies and private bankers throughout the United States. By 2 A. M. they all had been transmitted, and during the following forenoon answers to most of them were received and delivered.

The total number of separate messages sent and answers received on the two occasions was about 17,500. They were in reference to subscriptions to the proposed government bond issue, and the transaction is an object lesson showing the extent of the facilities and superiority of service of a great telegraph corporation and the enterprise of a successful newspaper corporation.

Telephone Bids Wanted.

Herbert Averill, manager for the Postal Telegraph Company at Montague, Me., and also electrician for the Howland Falls Pulp Company, is making arrangements for a telephone exchange which will extend its services throughout that section. Mr. Averill says he is in the market for quotations from reliable dealers in telephones and supplies.

COMPUTATIONS FOR COIL WINDINGS.

BY J. B. BAKER.

It is sometimes convenient, in winding a coil for any experimental purpose, to be able to pre-determine the proper dimension and size of wire without having to spend the time and material which would otherwise be wasted in winding up several trial coils in an attempt to find a winding which just meets the required condition. Such a case would be the winding of the field magnet of a dynamo or the coils of a telegraph relay. For an experimental winding in such cases, where any particular result is in view, the proper winding to accurately meet the required condition can be more readily determined by computation with the data of these conditions than by a series of trial windings. Further, the computations thus made for any particular case have the merit of giving a general solution of the problem involved, thereby providing information of value in the winding of future coils for a similar purpose.

In the discussion which follows, it is assumed that the coils considered are all of the ordinary cylindrical form, and that the only insulation used between the turns or layers of the coil is the original insulating covering of the wire itself. It is further assumed that the thickness of the insulation on the wire can be accurately determined, as well as the diameter of the bare wire and dimension of the coil space. The wire, bare and insulated, can be readily measured with a micrometer caliper.

Fig. 1 shows the dimensions of the cross section of a partially wound cylindrical coil, which is needed in determining the winding. In the diagram, L is the length of the coil-space between the end-pieces which support the coil in place, D is the outside diameter allowed for the coil, and d is the inside diameter of the coil. These three dimensions are determined by the condition of available space, size of iron core, maximum allowable resistance of coil, etc. Also, let W be the diameter of the insulated wire, when tightly squeezed in the micrometer caliper.

Fig. 2 shows, by an enlarged cross section of three contiguous turns of the winding, the effect of the usual method (where no additional insulation is used between the layers) of winding the successive layers of wire in the spaces of the preceding layers. Calling the thickness of the layer equals the vertical distance between axes of the turns, the figure clearly shows this distance to be W sin 60 degrees instead of W, as would be the case were the successive layers wound with the turns vertically in line. Hence, in the case supposed, where the depth of the coil space is $\left(\frac{D-d}{2}\right)$, we have,

$$\text{number of layers} = \frac{\frac{D-d}{2}}{\frac{\sqrt{3}}{2}W} = .577\frac{D-d}{W} \quad (1)$$

The number of turns for the first, third, fifth, etc., layers is to be found by dividing the length of the coil-space by the diameter of the insulated wire. But, as shown in Fig. 1, every alternate or even layer, counting from the core number, has one turn less than the odd layers have, in a regularly wound coil where the length of the coil-space is fully covered by the first layer. Then, there will be one turn lost for every two layers of the coil. This fact can be allowed for

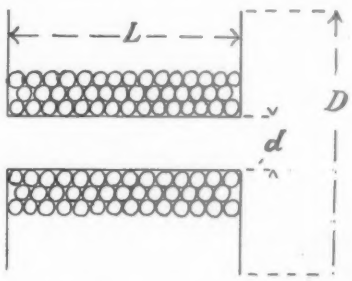


FIG. 1.—CROSS SECTION OF A PARTIALLY WOUND CYLINDRICAL COIL.

otherwise, and neglected at this point, thus giving

Number of turns per layer

$$= \frac{L}{W} \quad (2)$$

From (1) and (2) we obtain the total number of turns in the coil, the product, the layers and the turns per layer; or,

$$N = .577\frac{(D-d)(L)}{W^2} \quad (3)$$

We may write for the insulated wire in the coil,

$$W = w + I \quad (4)$$

where w is the diameter (in inches) of bare wire and I is the double thickness of the insulation.

From (3) may be obtained

$$W = \sqrt{\frac{.577(D-d)(L)}{N}} = .76\sqrt{\frac{(D-d)(L)}{N}} \quad (5)$$

From this and (4) we have

$$w = .76\sqrt{\frac{(D-d)(L)}{N}} - L \quad (6)$$

Equation (5) or (6) enables us to find the proper size of wire that will make a full coil of stated dimensions having any desired number of turns,

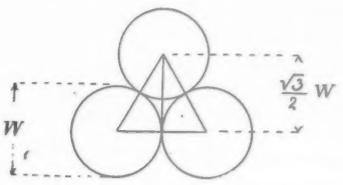


FIG. 2.—ENLARGED CROSS SECTION OF THREE CONTINUOUS TURNS OF WINDING.

N, by comparing W, or w, as computed, with a wire table.

The length of wire (in feet) in the coil, which call l, may be found from the dimensions of the coil, as follows:

$$l = \frac{\left\{\begin{matrix}(\pi)\ \text{(mean diameter of turns in coil)} \\ \text{(total number of turns)}\end{matrix}\right.}{12}$$

$$= \frac{3.14}{12}\left(\frac{D+d}{2}\right)\left(.577\frac{(D-d)(L)}{W^2}\right) = .076\left(\frac{(D^2-d^2)(L)}{W^2}\right) \quad (7)$$

From (7) may be readily found the actual lengths to fill a cylindrical coil whose dimensions are D, d, and L, of wire of various sizes corresponding to W. From a wire table the size required to give the resistance desired may be selected.

For determining the number of ampere turns in a proposed coil, as in the case of a field-magnet winding, enough data are furnished by the equations already derived, with the aid of a wire table. The latter may be dispensed with, however, by inserting in (7) an expression for the resistance of the coil and combining with (3), as follows:

If E is the electro-motive force impressed at the terminals of any coil of wire of resistance R and having N turns, then the

$$\text{Ampere turns} = \left(\frac{N}{R}\right)E \quad (8)$$

By (3) and (7)

$$N = .577\frac{(D-d)(L)}{W^2} \text{ and } l = .076\frac{(D^2-d^2)(L)}{W^2}$$

Assuming the resistance of one lineal foot of copper magnet wire to be 10.79 ohms, the resistance of a length l foot of this copper w inches in diameter is

$$R = \frac{10.79\,l}{(1{,}000\,w)^2} \quad (9)$$

Substituting from (7) in (9), we get

$$R = \frac{(.076)(10.79)}{1{,}000{,}000}\frac{(D^2-d^2)(L)}{(W^2)(w^2)}$$

and with (3) as a numerator

$$\frac{N}{R} = 704{,}000\frac{w^2}{D+d} \quad (10)$$

(10) gives a coefficient to be computed for any value of w, and used in (8) to find the ampere turns in the coil when impressed with E volt.

Georgia Water Power.

Mr. John Hill, of Columbus, Ga., has bought the land and water power formerly controlled by the Rock Island Paper Mill on the Chattahoochee River near Columbus. The water power at this point is said to be the easiest to control of any on the river. There is an available fall of 20 feet, and a dam 200 feet long is already standing, with the exception of a break 60 feet long, which can be readily repaired. In former times 3,000 horse-power was obtained from this fall. Mr. Hill is reported to have engaged consulting engineers with the idea of developing this water power, which is located less than a mile from the corporate limits of Columbus.

No great difficulty presents itself in the measure of very high potentials, says A. Lemoine in *L'Eclairage Electrique*, except for the necessity of maintaining the potential constant for the period during which the reading is taken. This end is attained by employing an overcharged system obtained by establishing a permanent discharge between two conductors from an electro-static machine. Under these conditions the variations of potential were found not to exceed one in 1,000.

A recent cable dispatch states that in consequence of experiments with the Roentgen rays, enabling the reading of the contents of enclosed letters, a Berlin chemist is making experiments with a substance for the manufacture of envelopes which will be impervious to the rays.

The Value of the Fuse.

The Shawmut Fuse Wire Company, of Boston, in presenting its fifth annual catalogue, makes some very sensible remarks which will bear republishing in the ELECTRICAL REVIEW. They are as follows:

It is particularly gratifying to us that the year just past has been the most prosperous one we have ever had, for there has never before been so much discussion of fuses and so much interest in securing the best that are made.

We feel that we are justified in taking a good deal of the credit for this great interest, because for five years we have urged the need of a better understanding of fuses, and have done our best to disseminate information. Four years ago, in our "Fuse Wire and its Uses," we discussed at some length the limitations and peculiarities of the fuses which are now receiving so much attention.

The opponents of fuses have led many people to believe that they are useless and more of a danger than a protection.

There is no reason for this opposition. The trouble with the best fuses comes not from inherent defects, but from careless and ignorant use, and we are confident that this truth will be seen by any one who will give the matter unprejudiced consideration. We urge that, when the value of fuses is to be judged, experiments be made on the link form, where the size of the wire is carefully chosen and the length fixed. If you will use wire alone, you must make allowance for its length.

A protective device should protect against real evils, and we should understand the exact nature of the evil that we fear. With electric currents, we wish sometimes to protect against heavy loads and sometimes against overheating of conductors. The heavy load comes with an excessive current, however short, and to prevent this an automatic cut-out should be used. Overheating of conductors comes from continued excessive currents, and against these the fuse is adequate as a protection, and its use assures a minimum of trouble because it opens the circuit only when the excessive current continues long enough to cause overheating. Time and current combined overheat conductors; time and current combined melt fuses. When this combination becomes excessive, the fuse operates; but it does not operate with the excess of only one of the factors, as the automatic cut-out does.

Expressed differently, the load that will be thrown on a machine depends upon the current C; the overheating of conductors depends upon C^2T. If we wish to protect against mechanical strains, we must use a device that will operate when C alone becomes excessive. If we wish to protect against the overheating of conductors, we use a device that will operate when C^2T becomes excessive. A proper fuse does not operate the instant that C becomes excessive, but it does act the instant that C^2T becomes excessive.

The fuse is the simplest electrical device possible, for there is no mechanism; it is easily adjusted, cheap and convenient; when properly proportioned, its accuracy is well within exacting limits; and it is the only device that protects in the proper way against the overheating of conductors, for it acts only because of the excess of the combination that causes the trouble.

A Combined High-Pressure Separator and Steam Receiver.

The fall of pressure that takes place between the boiler and the engine, due to the fact that the volume of steam necessary for one stroke of the engine has to be drawn from the boiler through a long and sinuous pipe during the short period of admission, which in an ordinary Corliss engine is only one-fifth to one-quarter of the stroke, has always been a source of annoyance to engineers. This reduction of pressure, as shown by indicator cards, generally amounts to from five to ten per cent of the boiler pressure.

Using very large steam pipes reduces the loss only in a measure, while it is open to the objection of increased cost, greater difficulty in keeping the joints tight, especially under high pressures, and greater liability to accidents. Steam pipe explosions have unfortunately been too frequent of late.

In view of all this it has become the practice in large plants to place a large reservoir or receiver close to the engine, thus insuring a free supply of steam at substantially full pressure during admission, the boiler having ample time during expansion to again restore the pressure in the receiver. A receiver of this kind for high pressures has to be specially designed and exceedingly well made. Its construction can not be entrusted to any ordinary boiler-maker, as, being an engine room appliance, nicely covered and lagged, the slightest leak must be avoided.

All these considerations have led the Goubert Manufacturing Company, of New York, manufacturers of the Stratton steam separator, to design a combined separator and steam receiver. The making of the two appliances into one, while insuring a supply of perfectly dry steam at full pressure to the engine, economizes space and makes a much neater appearance as well as lessens the number of joints that would be necessary if two different apparatus were used. The large experience and manufacturing facilities of this company for high-pressure work are a guarantee that nothing but good and tight work with a safe and efficient apparatus will be furnished.

The Goubert Manufacturing Company have already supplied these combined separators and receivers to a number of large power plants. Among them may be mentioned the United Electric Light and Power Company, of New York; West End Railway Company, of Boston, and the Nassau Electric Railroad Company, of Brooklyn.

The accompanying engraving shows one of four of these Stratton combined separators and steam receivers connected to 1,200-horse-power Westinghouse engines at the new power house of the United Electric Light and Power Company, East Twenty-eighth street, New York city. The following letter from the chief engineer of this company may prove interesting:

THE UNITED ELECTRIC LIGHT AND POWER COMPANY,
108 FULTON STREET,
NEW YORK, February 21, 1896

GOUBERT MANUFACTURING COMPANY,
14 Church Street, City.

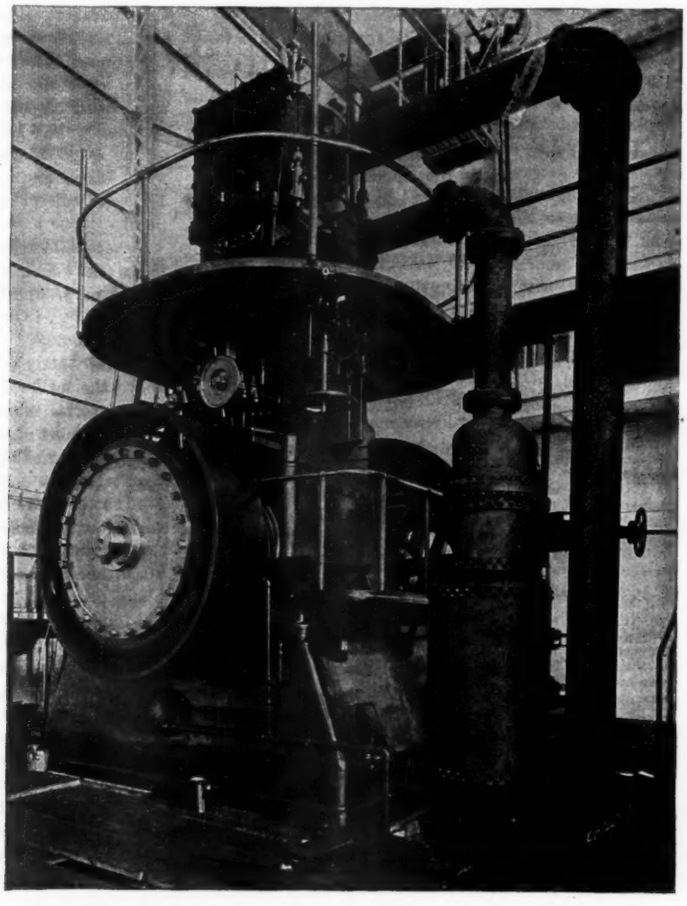
GENTLEMEN: Yours of the 30th ultimo received. In reply I would state that the form of combined separator and receiver furnished by you for the Twenty-eighth street station of this company has proven most satisfactory in every respect.

The separators remove practically every trace of entrained water, while the receivers keep a constant supply of steam right at the throttle, which is not affected in pressure by the pulsations of the engine to an extent of over one-half of one per cent.

I have made several tests to ascertain the drop in steam pressure between the boilers and the receivers, and even when the engines are loaded I can not find any appreciable drop. In making these tests I have used two indicators, which were first placed on the steam pipe, side by side, and ascertained to be precisely alike; then one was placed on the separator and one on the steam header in the boiler room. Cards were taken from these indicators at the same instant, and after the experiments were completed the indicators were again calibrated and found to agree. In all these tests the difference in steam pressure at the two points was scarcely discernible.

I may also add that, in consequence of maintaining a constant pressure at the engine, there is practically no vibration in the steam pipe.

Very truly yours,
H. W. YORK, Chief Engineer.



A COMBINED HIGH-PRESSURE SEPARATOR AND STEAM RECEIVER, IN THE PLANT OF THE UNITED ELECTRIC LIGHT AND POWER COMPANY, NEW YORK CITY.

The March number of *Current Literature* is a marvel. It contains 103 prose articles and 39 poems. Mere figures do not show value, but every prose article and every poem in the number is well worth reading. The opening department contains three strong editorials on Drink in the Public Schools, the Way of the Reformer and the Genealogy of Scientific Discovery. So carefully planned and edited is *Current Literature*, that it seems each month not only to keep one thoroughly abreast of all current thought, but to run the gamut of all the emotions and to have something for every member of the family and for every taste.

A Suggested Reorganization Plan for General Electric.

[*From the Boston Herald.*]

This column is not given to advising anybody, but it suggests to General Electric common shareholders that a protective committee, to look out for the common lien in the arrangements which the committee of preferred shareholders may seek to perfect, would be a prudent appointment. There is a suspicion abroad that the preferred shareholders' committee might find that the preferred and debenture liens were more in harmony than the preferred and common liens. Moreover, if the common shareholders do not look out for themselves, it is not to be expected that anybody will look out for them. Acting together, the common shareholders might accomplish a good deal. One suggestion is that par for the stocks be reduced to 50, leaving the number of shares as at present. It is said that the preferred shareholders would accept this if they were still allowed $7 per year—14 per cent on 50—in dividends. The common shareholders would hardly assent to such a proposition. Why not convert all securities into a single stock at a fair valuation—perhaps the market valuation—say, $20,000,000 in all? The bonanza days of the Thomson-Houston company were the days of a single class of stock without bonds. The General Electric Company could presumably pay five per cent, and perhaps six, handily on $20,000,000, and accumulate a working balance. The impairment of capital would disappear under such a plan of reorganization. Take the market value of the securities in round numbers and this summary is shown:

$30,460,000 common, at 30	$9,138,000
4,252,000 preferred, at 65	2,763,800
8,750,000 debentures, at 90	7,875,000
$43,462,000	$19,776,800

The above works out wonderfully close to the $20,000,000 suggested capital. The preferred stock is preferred as to dividends only, and the market price appraises this fact as to the past and future. If the holders of all the liens are to insist upon their pound of flesh, it is difficult to see how any but the debenture holders are to obtain income.

Common Occupancy of Street Railway Tracks.

After a great many hearings, extending over a period of four weeks, the Board of Public Works of the city of Columbus has granted the right to the Columbus Central Railway Company to connect its tracks at Fulton street, in the southern part of the city, with the tracks of the Columbus Street Railway and run its cars over the tracks on High street to Spruce street. This makes a joint occupancy by both companies of the important territory on High street, a distance of about 7,500 feet. The movement met with the most determined opposition on the part of the Columbus Street Railway, but public sentiment was strongly enlisted on the side of the Central Railway, and the board after a very careful consideration took the above mentioned action.

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SPECIAL NOTICE TO ADVERTISERS.

CHANGES for advertisements must be in this office by Friday noon for the following week's issue.
NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.

NEW YORK, MARCH 4, 1896.

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The Institution of Electrical Engineers, of London, is making an effort to enlist electricians in the volunteer service of Her Majesty's Government. It is interesting to note that electricians have for some time past occupied a position of recognized value in our own Naval Reserve. And that, too, without the influence or assistance of any electrical engineering society.

ONE WAY OF SELLING GOODS.

The ELECTRICAL REVIEW has lately received an unusually large number of complaints from purchasers of electrical and steam apparatus in regard to the treatment they have received from salesmen for manufacturers. The burden of the complaint lies in the fact that the customer does not receive sufficient attention after the contract is signed. In other words, the main object of the salesman seems to be to sell his goods. When the contract is signed his interest in his customer apparently ceases, and he does not bother about the possibility that something may be wrong in the apparatus itself, in the way it is installed or its apparent failure to do the work expected, owing to a misunderstanding of the conditions.

The salesman's duties should include a few calls upon the customer after the apparatus has been purchased and installed to see whether it is working right and whether there are any errors which should, in justice to the customer, be corrected. This should be done not only from a moral standpoint, but for the salesman's own good. If the customer's first business transaction with a manufacturing house is not satisfactory, it will probably be his last, for the reason that competition in nearly every line of manufacturing is so intense that very often a personal friendship or a kind word from a friend of the salesman will secure an order for him, provided everything else is equal. Under these circumstances, which are well recognized both in the trade and outside, it behooves the salesman to make a friend of every customer—especially every new customer.

There are many alleged salesmen in the electrical and allied industries who are good men as far as selling the first order is concerned, but when it comes to the second or third order they are at sea, because they have either misrepresented their goods in the first sale or because they have not paid sufficient attention to their customer's interests. It has become an established principle in many of the older lines of trade that the salesman is paid to look out for his customer's interests as well as those of the firm from which he is drawing a salary. Electrical salesmen will do well to bear this point in mind.

Telephone men all over the country are watching with interest the efforts of the Norwalk, Ohio, Telephone Company to compel the Central Union Telephone Company and the Ohio Telephone and Telegraph Company to transmit its messages as common carriers.

WALL STREET AND THE ELECTRICAL STOCK MARKET.

The stock market was strong up to Friday, when it broke on a Cuban war scare. The movement was entirely the result of professional manipulation, emanating for the most part from interests who sold out some little time ago on the advance and who saw the market getting away from them. One or two stocks were selected as a basis for attack and confidence was so utterly destroyed on Friday afternoon that there was practically no support to prices. The absurdity of the movement became apparent over night, and on Saturday there was general buying, both for long and short account, bringing about a substantial rally throughout the market. The move had no significance outside of Wall street.

Various lines of trade are reported to be in better shape than a week ago, owing to the steady growth of confidence that followed the success of the bond issue. Money is somewhat easier and sterling exchange 1¼ cent below the specie or export point.

General Electric was active most of the week. The high price was recorded on Wednesday and Thursday, it being 32¼. On Friday's slump it went off to 30⅝. Saturday it had a sharp rally and closed at about 1 point above the low. There were a great many stories afloat concerning the property, most of which were bullish. It is now claimed that earnings for the year will show something like 3 per cent on the common stock after a revaluation of assets is made. Up to this writing there has been a lack of all authentic information regarding plans proposed to correct the capital impairment. Some of the papers are beginning to discuss the attitude of shareholders towards a scaling of 50 per cent of their holdings. The annual meeting occurs on May 12.

The Westinghouse company promises to issue a circular within a short time with a description of an underground trolley that it has had under test all Winter, and which is now said to be ready for the market. The claim made for it is that it can be operated 50 per cent cheaper than the Lenox avenue system, installed by General Electric. During the month of January the company made a gross shipment of apparatus of $680,000, which is said to be the largest in its history. The stock was quoted at 29 @ 29½ for the common and 52 @ 52¼ for the preferred, with very little doing.

Of the other stocks less active, Western Union Telegraph recorded 86½ on Monday, and under bear attack went to 83 on Saturday. Edison Electric Illuminating of New York sold from 96 to 97¼. The old bonds were traded in at 108¾ @ 109, the consolidated 5's at 101½. The Edison company of Brooklyn bonds were quoted at 109. There was considerable activity in North America on negotiations for a sale of its Milwaukee Street Railway securities that has not yet been consummated. In the latter days of the week the stock

lost a small fraction, closing at about 5½. American Telegraph and Cable had two sales at 93 and subsequently one at 92.

On the Boston Exchange, American Bell was unaffected by the slump in the general market, being steady all week at 203. Erie Telephone was practically unchanged at 60½. New England Telephone lost 1 point, selling at 88½. In Philadelphia, Electric Storage was practically featureless. The common had an advance of 1 point during the week and reacted to opening figures. This was about the course of the common.

The Electric Storage Battery Company has contracted with the government to equip a submarine boat with batteries. It has also secured orders for a large equipment for the Union Traction Company. The cost of the boat equipment will be about $20,000.

The stockholders of the Interior Conduit and Insulation Company will meet on March 9 to consider a proposition to issue bonds not exceeding $200,000.

The Mexican Telephone Company, for the 10 months ended December 31, 1895, shows: Gross, $93,818; increase of $6,461. Net, $45,245; increase, $8,763. Total subscribers, 2,302; gain since March 1, 211.

The Commercial Cable Company reports net earnings for the year of $1,215,308, an increase of $204,870. The surplus is now $515,308. The working expenses were $594,433 for ordinary operation, $83,127 maintenance and repairs, $91,959 rent wires and $23,498 legal expenses. Of the surplus there was transferred to reserve $200,000, leaving a profit and loss balance of $315,397.

BAIN.

New York, February 29, 1896.

The Electrical Exposition.

The public will have an opportunity to witness the new method of photographing through solids at the electrical exposition to be held in New York city in May, in connection with the Nineteenth Convention of the National Electric Light Association.

Mr. Edison has succeeded in making a picture through eight inches of yellow pine, and anticipates no trouble whatever in making instantaneous shadowgraphs. He has generously offered to send to the exposition his most powerful and improved apparatus for making shadowgraphs and his own corps of laboratory assistants to operate the same.

Mr. Edison will also send to the exposition his large collection of experimental apparatus and designs pertaining to his early work on his many inventions, much of which has never yet been shown to the public.

X-Ray Test for Diamonds.

It is reported that Prof. William Lispenard Robb, of Trinity College, Hartford, Ct., has made X-ray pictures of a real and an imitation diamond. The genuine stone was transparent to the rays while the artificial stone cast a solid opaque shadow.

The Metropolitan Telephone Company's New Contract Office.

Since the Metropolitan Telephone Company, about two years ago, made a bid for the patronage of people who could not afford to appropriate $240 a year for unlimited telephone service by introducing the wise and just "message rates," the telephone system of New York city has been built up by leaps and bounds, increasing in about 20 months from about 10,000 stations to 14,000. No small share of the credit for securing this phenomenal increase of customers is due to the company's contract department, which, under the able direction of its suave and energetic chief, Mr. T. H. Mack, has done yeoman service in making the advantages of telephone service in general, and the new scale of New York city rates in particular, widely known and appreciated among the inhabitants of the metropolis. Mr. Mack's department is rather wider in its scope than the name of contract department implies, as it has charge of practically all the relations between the company and the public; it is manned by a large staff of exceptionally promising and agreeable young men who, loyally carrying out the principles of courteous, straightforward, business-like dealing with the public laid down by their chief, have so far succeeded in discarding every trace of "monopolistic" methods that they have cultivated a widespread feeling of esteem and even of friendship for the company and its policy, which was not very prevalent a few years ago; on which—the present, not the past—the company is much to be congratulated; it has always aimed to furnish the best telephone service that science could produce and to satisfy its customers in all respects; that its policy has in the past sometimes been misunderstood is more to be attributed to the lack of an intelligent and serviceable medium of communication between the management and its customers than to any lack of good intentions on the part of the former. The contract department has changed all that.

During the past year or so the stream of new subscribers has been so great, and so large a proportion of it has flowed from the upper part of the city, where the message rates are found to be peculiarly attractive for private residences and retail stores, that the company has decided to open a new office for the contract department in its Thirty-eighth street exchange building, at 113-115 West Thirty-eighth street, between Broadway and Sixth avenue. This office, which will be open for business in the present week, will be equipped and manned in all respects on an equal basis with the main office of the department at 18 Cortlandt street, so that all information can be obtained there and all business relating to telephone service transacted as easily and as efficiently as at headquarters. There is no doubt that intending telephone subscribers who live and do business uptown will find the new office a great convenience. As the district in which the office is established is the very heart and center of uptown New York, this new departure should meet with much success in developing the work the contract department has so ably carried on for the past two or three years.

Is a Telephone Company a Common Carrier?

An interesting legal question, which may have an important bearing on telephone development, is about to be decided at Norwalk, Ohio. On December 26, 1895, the Norwalk Telephone Company, through its president, Mr. C. H. Gallup, made a written request of the Central Union Telephone Company to be allowed to connect its exchange and system in Norwalk and its outside and toll lines with the local Central Union exchange. The Norwalk company offered to make the connections at its own expense or agreed to allow the Central Union company to do it and render a reasonable bill. The Norwalk company also offered the Central Union the same privileges over its lines. All these propositions were declined by the Central Union Telephone Company.

On February 25, 1896, the Norwalk Telephone Company filed a petition in the Common Pleas Court at Norwalk, seeking by mandamus to compel the Central Union Telephone Company and the Ohio Telephone and Telegraph Company to grant it the privileges mentioned above. The petition asserts that the Central Union Telephone Company, by its refusal, violates its duty to serve the public indiscriminately, and that a writ of mandamus compelling it to grant the Norwalk Telephone Company's request is the only relief in law which the latter has.

The Norwalk Telephone Company hopes to have the writ granted on the ground that the Central Union Telephone Company is violating the common carrier law which governs telegraph and other companies.

A New Engineering Firm.

W. D. Ball & Company, consulting electrical and mechanical engineers, 1625 Monadnock Block, Chicago, is the style of the firm succeeding the partnership of Ball & Allen, which has been dissolved, Mr. Allen retiring. The new firm is composed of Mr. W. D. Ball, who has been well known in engineering circles for several years, and Mr. F. E. Drake, formerly the general agent and assistant manager of the Standard Electric Company.

The new firm will continue to do consulting and engineering work, Mr. Ball taking the technical end, while Mr. Drake will have the management, caring for the general business. Mr. Drake's long experience in the commercial field of the industry, and his practical knowledge of the requirements of central station, isolated plant and general practice will be of much value to the new firm and its clients.

Feminine Electricity.

From the beginning it had been noticed that there were two kinds of electric force, says *Harper's Weekly*, but these were named, with reckless discourtesy, positive and negative, as though the second had been inferior, inactive, merely receptive. And yet there were suggestions of the true relations of these two forces that should not have been overlooked. It is recorded that six years after the St. Petersburg professor's fatal experiment (about 1759), Robert Symmer, "when pulling off his stockings in the evening, remarked that they gave a crackling noise and emitted sparks."

By varied experience he discovered that the electricity was most powerful when a silk and worsted stocking had been worn on the same leg, or, if the stockings were both of silk, then more diverting results were obtained when they were of different colors. Two white silk stockings or two black ones gave no electrical indications. When a black and a white stocking were withdrawn from the same leg, and then separated, they were so much inflated that each showed the entire shape of the leg, and at a distance of 18 inches they rushed to meet each other.

Separated by force they would again become inflated and be as ready to rush together as before. When this experiment was performed with two black stockings in one hand and two white in the other, the repulsion of those of the same color—their jealousy—and the attraction of those of different colors would "throw them into agitation and make them catch each at that of its opposite color at a greater distance." Plainly this Eighteenth Century student had to do with masculine and feminine electricity, and yet the unflattering term "negative," as applied to the feminine, has persisted even to our day.

Conduit Wiring for Railway Cars.

The Interior Conduit and Insulation Company, 527 West Thirty-fourth street, New York city, is introducing a very commendable system of conduit wiring for railway cars. The method consists of a system of insulating water-proof and electrically fire-proof tubes, which may be concealed in the frame work of cars after the manner of gas pipes. These tubes are run from the roof of the car to the motors, controllers and all lamp outlets in the car, thus making a complete insulated race-way for all wires. The dangers resulting from the accidental overheating or, perhaps, melting of wires and the consequent liability to destruction from fire, is claimed to be completely eliminated by the use of this system. The wires are perfectly accessible at all times, and in the event of the failure of any circuit from any electrical derangement, the defective wire may be withdrawn and a new one substituted in its place without removing the woodwork or defacing the interior finish of the car.

OUR CANADIAN LETTER.

ST. THOMAS, ONT.—Tenders for lighting the streets by electricity or gas are invited.

LANARK, ONT.—A bonus of $10,000 for an electric railway between Perth and Lanark has been granted.

SEAFORTH, ONT.—The townspeople of Seaforth, Ont., are going to install an electric fire alarm, purchase additional hose and generally improve their fire department.

TORONTO, ONT.—The Toronto & Suburban Electric Railway is completing plans for extending its line to Lambton and Islington, a distance of three miles beyond the present terminus.

BELLEVILLE, ONT.—The County Council has granted permission to the Belleville Traction Company to construct an electric railway, one and one-half mile in length, from the city limits westward.

YARMOUTH, N. S.—The Yarmouth, N. S., Telephone Company is stringing wires for the use of the Coast Railway Company, which will be operated by telephone instead of telegraph.

AYLMER, QUE.—The Deschênes Electric Company, Aylmer, Que., has been incorporated to build and operate works for the distribution of electricity. R. H. and John Conroy are among the promoters.

OTTAWA, ONT.—Mr. T. Vian, of Hull, has sold his franchise for building an electric railway from Hull to Aylmer and Gatineau Point, and for electric lighting of the city of Hull, to a company of Ottawa capitalists. Work will be proceeded with early in the Spring.

MONCTON, N. B.—The City Council of Moncton, N. B., has unanimously decided to petition the New Brunswick Legislature for the cancellation of the charter of the Moncton Electric Tramway Company for failure to fulfill the conditions of the charter.

HAMILTON, ONT.—The Lincoln County Council has granted the Hamilton, Grimsby & Beamsville Electric Railway a 70-year franchise for running power over the Queenston and Grimsby stone road, and work will be commenced at once to build the extension from Grimsby to Beamsville.

PORT MEDWAY, N. S.—A charter has been obtained to build an electric railway from Greenfield to this place, a distance of about 16 miles, along the Medway River. The company who is promoting it purposes building three pulp mills, working the gold mine at Greenfield, also going into lumbering and milling.

OTTAWA, ONT.—The Supreme Court of Ottawa has dismissed the appeal of the City of Vancouver. This upsets the by-law passed by the rate-payers in 1894, authorizing a civic electric lighting plant. The council has now passed a by-law providing for the lighting of the city by the Western Electric Company.

J. A. C.

Montreal, February 25.

Death of Samuel Edison.

Samuel Edison, father of Thomas A. Edison, died at the home of his niece, Mrs. Poyen, in Norwalk, Ohio, on February 26. He was visiting Norwalk on his way to Fort Myers, Fla., his son's Winter home. His death was due to old age and a general breaking down of the system.

Samuel Edison was of Dutch ancestry and was born in Digby, Nova Scotia, on August 7, 1803. He was a famous athlete in his younger days and maintained his robustness of

SAMUEL EDISON.

physique up to the time of his death. He was a great runner and walker. He was married to Miss Nancy Elliott, a Scotch woman, in 1824. She died in 1884. The only children surviving are Thomas A. Edison and his sister, Mrs. Marion Page, who lives near Norwalk, Ohio. Mr. Edison always pronounced his name "Eedson," but admitted that the popular pronunciation was the correct one. His family was noted for its longevity. He had two aunts who died in their 99th year and his father was 103 years and 22 days old when he died. Of late years Samuel Edison had made his home in Port Huron, Mich., from which place he was buried at Thomas A. Edison's request.

Samuel Edison was a remarkable man in many ways and is the hero of several anecdotes. One of these is to the effect that when he was 75 years old he expressed a desire to visit Europe. Thomas A. Edison gave him a letter of credit for $1,500, and the old man, with a chum of his, 65 years, whom he called "The Boy," sailed away, intending to be gone only a few weeks. They were gone over four months, going through England, Scotland, Ireland, France, Germany and Holland, traveling on foot most of the way, and finally reached home with $650 left. For several years before his death he carried a cane, but got angry if any one tried to help him in any way, and refused to admit that he was an old man.

"When he was 76 years old," said Thomas A. Edison, in speaking of his father several years ago, "he wanted to pay me a visit at Menlo Park and by mistake got on a train that did not stop there. Just as he got to the station and found the train was going through he grabbed his gripsack and jumped. He was pretty badly used up when he came up to the laboratory. His clothes were torn and his face scratched. He was more crestfallen than hurt, I believe, and said to me:

"'I tell you, Tom, I wouldn't do it again for $10.'

"He limped around for several days and then I found out what led him to make the jump. When I was a newsboy in Michigan I always used to jump from the trains, as the depot was about a mile from where my route commenced. I always had several loads of sand dumped at the place and jumped off into that. I did this regularly and got so expert at it that I could jump from trains going 40 miles an hour. The old gentleman remembered it and thought he was able to do the same. He afterward admitted that."

A New Ceiling Rosette.

A rosette with new features of excellence is a novelty at this day. It is called the C-D after the makers, the Chapin-Douglas Electric Company. By reference to the illustration it will be seen that there is a yielding arm (Y) in the cap for the purpose of contact. This yielding arm can be adjusted to take up any wear of the contact surface. The cap on which the yielding arms are fastened is held in position by the shoulders on the projecting piece in the base. The yielding arm slides under this shoulder when in position. The C-D rosette should be popular because of rapidity in putting up, the caps being interchangeable. The entire construction of the C-D rosette has been given careful attention.

A NEW CEILING ROSETTE.

The porcelain in the base covers the joint at the cap. Space has been given in the location of the pieces in the cap to accommodate the big thumbs of large wiremen. The C-D rosette is made in square and round base patterns.

Radiograph.

[*From the Boston Herald.*]

The pictures made by the Roentgen rays are still without a generally agreed upon name, skotograph, shadowgraph and electrograph being among the number used by different experimenters. The ELECTRICAL REVIEW suggests what appears to be a sensible and appropriate name for them, namely, "Radiograph."

MILITARY TELEPHONY.

DESCRIPTION OF THE P. CHAROLLOIS SYSTEM, USING A SINGLE UNINSULATED WIRE.

Amongst the resources that modern science places at the disposal of armies in campaign, certainly telegraphy and telephony, notwithstanding their modest position, constitute most important aids to victory in modern warfare, says our London namesake.

With their aid, commanders of armies can centralize almost instantaneously all the information required, and thus arrange their forces as advantageously as possible. By their means remarkable precision and rapidity are imparted to military operations. In short, they enable orders to be transmitted in all directions with the precision and promptness of direct commands. The improvements that are continually being introduced into the art of war render its operations more complicated and more delicate every day. Rapidity in the execution of movements has assumed the utmost importance; so much so, in fact, that victory is generally due to promptitude in carrying out operations both offensive and defensive.

When two nations are at war with one another, we may say that to a certain extent victory remains with the one that effects its mobilization in the minimum of time, transporting, as far as possible, and with the least possible delay, the greatest number of mem supplied with rapid-firing guns, their supplies of provisions being promptly renewed.

Once out in the open country, beyond large railways and other main roads, the troops are generally scattered over large tracts of country, and are, as a rule, without any regular means of intercommunication. It is here that telegraphy steps in, and also telephony, although the latter has not as yet unquestionably asserted its *raison d'état*, in the first place because it is only of recent date, and secondly, because the apparatus and installations used up to the present have not possessed the qualifications required to give complete satisfaction. By concentrating all his thoughts on the study of this important question, writes M. Pesce in *La Nature*, Captain P. Charollois, of the 115th line regiment, has arrived at a very ingenious solution of it, after long and careful experiments. It was by endeavoring to impart to the telephone, as used for campaigning, all the practical qualities that it lacked, viz., simplicity, lightness, solidity, facility and rapidity of installation, convenience in communication, and to render this very valuable auxiliary easy of manipulation that Captain Charollois was first lead to use only a single wire for his telephonic transmissions, using the earth as a return.

This first point is of great importance in itself; but its value is enhanced by the proof of the uselessness of insulation in the wire. In fact, as

the result of numerous experiments, Captain Charollois showed that a metallic wire, unwound along the ground, without any precaution as to insulation, had the property of conducting to comparatively great distances—20 kilometres at least—the induced currents circulating between two electric, or even simply magnetic, telephones placed at the extremities of this single wire, considered as a line, the return being made through the earth.

After many experiments and trials, Captain Charollois has been led at last to use a compound wire of pure copper with a steel core. This wire possesses all the qualities for the purpose—conductivity, solidity, lightness, flexibility; it does not become oxidized, and is inexpensive.

Captain Charollois has also brought out a microphonic transmitter and receiver so sensitive that conversations can be exchanged in the ordinary voice, at a distance, without having to lean over the apparatus, as we generally have to do with ordinary telephones.

To obtain greater precision in communication, and, above all, to render the call bells more distinct, small dry batteries are used, attached to the transmitter, and enclosed with it in a sheet-iron case for protection.

The telephonic post thus formed is carried on the back, and communication is obtained by uncoiling the wires by means of a special spool, the return being effected through the earth by the employment of rods, or even bayonets, buried in the ground and connected with the post by earth terminals.

Fig. 1 represents the traveling post at work, with the bayonet buried in the earth for the return circuit. Fig. 2 shows the transmitting apparatus.

Instead of an electric telephone, and provided that there is no complication, we may use a magnetic telephone, which is still simpler. Captain Charollois has, in fact, conceived and constructed some microphonic receiving transmitters of remarkable simplicity and sensitiveness. The military operator carries the apparatus suspended to his hat, near his ear, in order to listen, and brings it to his mouth in order to speak. For greater convenience two telephones may be used, one for listening and one for speaking, the latter being hung round the neck on a cord.

Organization of the Regimental Telephone Service—This organization comprises two distinct services:

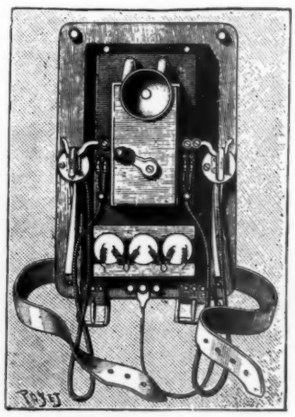
1. The regimental service, entrusted to the sappers.

2. The company service, entrusted in each company to four soldiers and a corporal appointed by the captain.

The Regimental Service — The object of the regimental service is to establish telephonic communication between the regiment and the brigade or division, and also for all operations requiring lines of great length. On fields for shooting practice, these movable telephone lines are also used, and they are of the greatest service in artillery practice and regulation shooting. These lines, which consist of wires six-tenths of a millimetre in diameter, may be 20 kilometres in length, and must often remain in position for several days without being taken up. They have, therefore, to be laid with a certain amount of care. The apparatus required is as follows:

Regimental Apparatus — Six unwinding reels, six kilometres of wire, six magnetic telephones, three hooked bamboo rods, four earth terminals, four hooks for suspending the telephone. The weight of the reel when wound with one kilometre of wire, is 3,500 kilograms.

The Company Service—The object of this service is to enable the company to establish, under any circumstances of the campaign on the field of operations, one or more telephone lines capable of attaining a total length of four kilometres. The principal cases in which they are used are as follows: To connect the main body with the sentries and with the outpost reserves; to transmit to the main body the information gathered by the patrol; for use in the cantonments; the connection of detached services over irregular ground, mountainous or wooded districts, etc.; the judging of distances in shooting practice.



FIGS. 1 AND 2.—CHAROLLOIS'S SYSTEM OF MILITARY TELEPHONY.

As these company lines are always established on peaceful territory, there is no need to suspend the wire, and it is simply unwound along the ground. The company apparatus has, therefore, been reduced to the simplest possible form by using wire four-tenths of a millimetre in diameter, wound on a spool of small dimensions, and suppressing the bamboo rods.

Company Apparatus—Two unwinding reels, four kilometres of wire (two kilometres per reel), four magnetic telephones, three earth terminals, three telephone suspension hooks. The weight of the complete reel, wound with two kilometres of wire, is 2.500 kilograms.

Establishment of a Regimental Line—Suppose that a line of six kilometres is to be established; the corporal, or a supplementary operator, takes up his position at the point A, placing his telephone to his ear, connecting it by one of his conductors with the line, and by the other with his bayonet stuck in damp soil. The first set of men begin to unwind the wire. To do this, the bearer of the reel marches in the direction B at quick march, without troubling about the wire he leaves behind him. He takes care to march towards the supports to which the wire is to be hooked or suspended.

His comrade, who is provided with the hooked rod, follows him and hooks the wire to the natural supports that he finds on the way—trees, houses, hedges, etc. In default of natural supports, the wire is allowed to lie along the ground, preferably in furrows, trenches, etc. The line, whether suspended or lying on the ground, must be protected from any conditions likely to cause its breakage.

The first set of men having unwound their 2,000 metres, the bearer of the telephone takes up his position at *a'*, an intermediate post, as has already been done at point A, and at once enters into telephonic communication with his comrade at the head of the line. When the bearer of the rod for the first set has finished his work, he holds himself in readiness to inspect the line, so as to find out and repair any accidental breakage that may have occurred, and that would be indicated by the cessation of communication. Thus these two men have the charge and superintendence of the portion of the line that they have laid down. They become, so to speak, its guards.

The second messenger, having attached his wire to the line, proceeds, as has already been explained, for the first. This operation is continued as far as B. The line of six kilometres will comprise four telephonic stations —two terminal ones at the ends of the line, A and B, and two intermediate, *a'* and *a''*, for the inspection of the line. All these stations are in communication with one another.

This arrangement of the military line explains how unceasing surveillance can be exercised, how accidental breakages can be repaired and, lastly, how it was that a line of 25 kilometres was able to be taken up in one hour during the eastern maneuvers. The order having been given to all the stations at the same moment to take up the line, each set took up the line they had laid down.

Of course, when the country is quiet, the line well laid, and there is no reason to fear any accident, the intermediate stations may be suppressed, and the sound can be heard then all the better at the two extreme stations. With the object of insuring the greatest freedom of movement to regimental telephone operators, these men, during maneuvers and when on a campaign, receive the allowance granted to isolated members of the regiment, in order that they may be able to live in any part where they may be detained by their special duties. This measure was adopted during the eastern maneuvers.

Establishment of a Company Line—This operation does not need all the precautions that have to be taken for the protection of a regimental line. It consists merely in unwinding the wire along the ground, following, however, all the ditches, furrows or hollows, so that the line shall be as far as possible protected from breakage. The connections between the lines and to earth are made as above described.

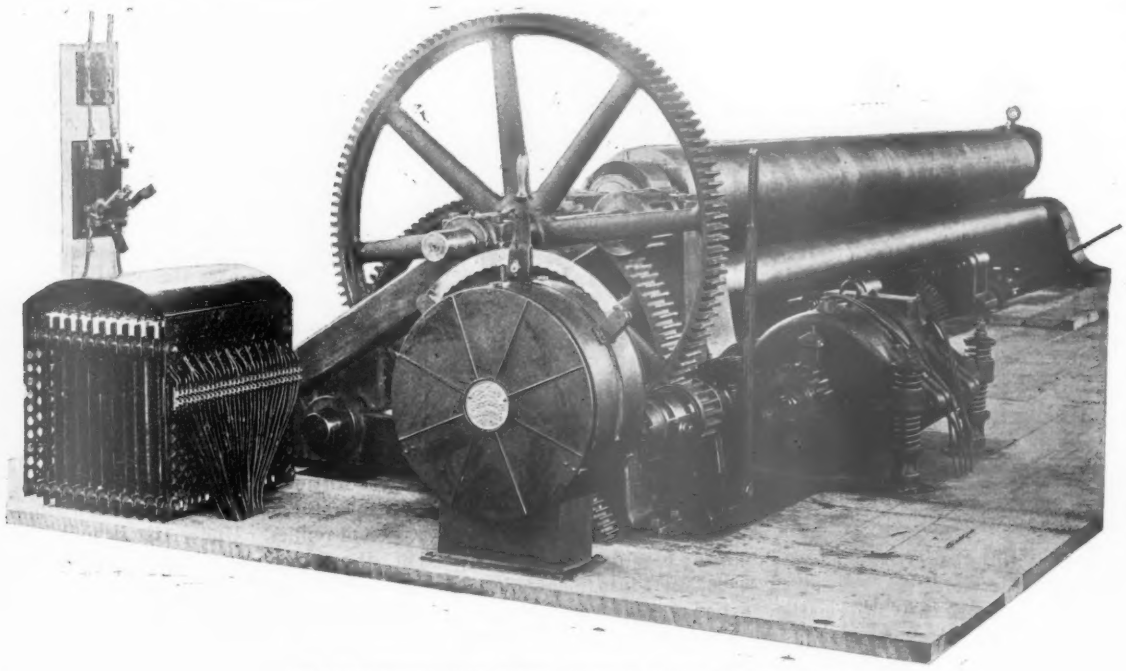
Communications with Operators on the March—In certain operations, such as reconnoitering, patroling, exploring, etc., it is important for the main body to have constant communication with the detachment sent out. In this case the operator with his left hand keeps the sword bayonet connected with the telephone at his ear. The current is then permanently established, even during the march, through the body of the operator and his feet, which tread the soil. Every call from the main body is distinctly heard by the telephone operator or horse soldier, who stops and replies. Under these conditions the commander of the main body has always these detachments under control, and can send them at any moment his orders and instructions. The operator or horseman being thus in communication through his body, should walk as much as possible on the earth or on grass, in order that his feet or his horse's should have good contact with the earth.

Employment by Cavalry—This telephonic system can be of great service to cavalry regiments for the rapid conveyance of information gathered by reconnoitering parties and sentries. The modes of communication are the same as for the infantry. Nevertheless, the horseman can, as described above for the foot soldier, be in constant communication, even when on the march, with headquarters. His telephone, which is at his ear, is in direct communication with the line by one of its conductors. The other conductor is connected with the bit, and consequently to earth through the body and shoes of the horse. If it should be necessary to establish a telephone line very quickly, the wire might be unwound by a cyclist. Extending the application of his naked-wire system of telephony to every-day uses, Captain Charollois has also constructed a series of instruments meeting ordinary requirements, and forming altogether a system of civil telephony that can be utilized in various ways.

Bending Rolls Operated by an Electric Motor.

The accompanying illustration shows a 30-horse-power series reversible motor, controller and rheostat attached to bending rolls capable of bending iron plates 20 inches long by one-quarter of an inch or more in thickness. The electrical apparatus illustrated in connection with the bending rolls is manufactured by the Card Electric Company, of Mansfield, Ohio.

The motor is of 30 horse-power capacity at a speed of 325 revolutions per minute under full load. It is geared direct to a shaft carrying a clutch which is operated by a vertical lever which engages in two trains of gearing, one for revolving the two lower rolls and the other for raising and lowering the upper one. As the motor is reversible, the manipulation of the rolls for bending plates on any circle is easily and quickly accomplished and with great accuracy.



30-Horse-Power Card Motor Driving 20-Foot Bending Rolls.

The rheostat is made up of iron wire in an improved form and has a capacity to carry the full current of the motor under all loads, and at any speed. The resistance is sufficient to permit reversing the motor at full speed and under all conditions.

The controller is particularly adapted and arranged for series-wound motors where close regulation of speed, sudden stops and quick reversals of motor are required. All the working parts are made amply large on account of the severe work necessarily required of such apparatus. The circuit is opened at 24 contacts, breaking in unison, reducing the spark to practically nothing. Twenty-nine contacts are provided for regulating the speed. By means of this construction any desired speed can be had and maintained, the resistance being so subdivided and the contacts so arranged for cutting portions of it in or out that arcing over and blistering the contacts is said to be impossible.

A competent man to run a telephone exchange of 60 to 80 subscribers in an Alabama town may be able to secure a position by writing to the Electrical Review, 13 Park Row, New York city.

The Electrical Association of Brooklyn.

A meeting was held at 17 Whipple street, Brooklyn, N. Y., Friday evening, February 28, to complete the organization of a society of electricians.

The meeting having been called to order, upon vote of those present Mr. G. H. Wood was chosen temporary chairman and M. R. Rodrigues as temporary secretary.

The name decided upon was "The Electrical Association of Brooklyn."

The objects of the association will be the promotion and study of the arts and sciences connected with the electrical and allied industries and the welfare of those interested in the same; also the maintenance of rooms and the procurement of apparatus and literature for their use. The association shall consist of associate and active members.

Associate members shall be those who are, or have been, connected with the electrical or allied industries, active members being those who possess a thorough knowledge of the principles of the electrical science.

The following were appointed to select rooms and to act as a committee on membership:

Messrs. G. H. Wood and H. Cramer, of the Brooklyn Edison Illuminating Company; A. Davidson, of the Commercial Cable Company; C. R. Underhill, of the Western Electric Company; H. E. Wadsworth, of the Tucker Electrical Construction Company.

Any further information regarding the association will be furnished by the temporary secretary, M. R. Rodrigues, 17 Whipple street, Brooklyn.

A meeting of the association will be held on Thursday evening, March 5, in the Edison Building, 370 Pearl street. Practical men are invited to be present.

Mr. Edward J. Hall, vice-president and general manager of the American Telephone and Telegraph Company, has returned to New York after a month's vacation, chiefly spent on the ocean.

X-Ray Progress.

[*From the New York Sun.*]

Fresh discoveries are daily announced in the field first opened by Professor Roentgen. That there is a possibility of enabling the human eye to see with ease concealed objects was demonstrated on Thursday at Kings College, London. One of the experimenters there says:

Without the aid of photography, by the means of a simple fluorescent screen and a suitable lens, I could easily see all the bones in my hand and wrist clearly and sharply defined and the action of the joints. Metallic objects were readily seen through a solid block of wood two and a half inches thick, such as is used in paving streets. A sixpence shut up between the pages of Bradshaw was clearly visible. These results were produced by the aid of a new vacuum tube designed and made in the college. The results can be readily seen either by daylight or gaslight, no darkening of the room being necessary.

Another London investigator, Mr. J. G. Vine, announces that he has been able to photograph at one end of a wire objects exposed between two vacuum tubes at the other end of the wire, and declares that he will soon be able to photograph objects at any distance by means of X or magnetic rays conveyed by wire. He described the process to me to-day, but forbade making public the details until the experiments are complete.

PERSONAL.

Mr. H. J. Medbery, president of the Fiberite company, of Mechanicsville, N. Y., visited New York city last week.

Among the prominent telephone men who visited New York last week were Col. Samuel M. Bryan, of Washington, D. C., president of the Chesapeake & Potomac Telephone and Telegraph Company; Hon. H. L. Storke, of Auburn, N. Y., president of the Empire State Telephone and Telegraph Company, and Col. David B. Parker, of Buffalo, N. Y., general manager of the Bell Telephone Company, of Buffalo.

Consolidation of Brooklyn, N. Y., Trolley Lines.

The Nassau Electric Company has about completed negotiations for the lease of the Atlantic Avenue Traction Company. The lease will be for 99 years on the basis of $180,000 a year after the first two years, during which two years the basis will be $150,000 each year. The Nassau company also guarantees by deposit of sufficient bonds to spend $500,000 the first year in improvements on the property. A new company is to be formed to succeed the present street railway company. It will have a capital stock of $4,500,000. By this arrangement the Nassau company puts itself in better position to reach central points in Brooklyn and Bridge terminals. It is probable that a meeting of the Atlantic avenue shareholders will be called at an early date to ratify the lease.

President H. M. Littell, of the Atlantic avenue line, will remain in Brooklyn during the present year. His company retains a large amount of valuable real estate. Hon. Tom Johnson, of Cleveland, Ohio, and Mr. R. T. Wilson, the banker, of New York, are the capitalists back of the Nassau company.

National Electric Light Association Convention.

To the Editor of Electrical Review:

The Trunk Line Association have granted a rate of a fare and one-third for the round trip from points in their territory to delegates attending the Nineteenth Convention of the National Electric Light Association, to be held in this city May 5, 6 and 7, 1896.

The convention will be held in a hall most admirably adapted for the purpose, in the Industrial Building, Forty-third street and Lexington avenue, during the progress of the great electrical exposition.

C. O. Baker, Jr.
Master of Transportation.
New York, February 29.

A Bi-metallic Coincidence.

Rather an unusual coincidence is found in this issue of the Electrical Review. On pages 124 and 125 is described Captain Charollois's system of military telephony, in which he employs a single uninsulated wire "of pure copper with a steel core." These pages were made up and on the press when there was sent to this office an advertisement of the Bi-Metallic Electric Transmission Company, 26 Cortlandt street, New York, in which apparently the same kind of a conductor is described. It is a little odd that the first mention of these two wires should appear in the same issue of the paper.

An Electric Air-Brake.

The Union Railway Company is making some very promising experiments with an electric air-brake on one of its cars at the West Farms car barns in the northern part of New York city. The brake is the invention of Dr. Northrop and the tests are being made under the direction of Messrs. F. W. Merritt, M. E., and A. R. Roe, E. E.

ADVANCE INFORMATION

Valuable News and Tips for Manufacturers and Dealers.

We publish below information relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW.

New Electric Railways.

NILES, MICH.—An electric street car line will probably be constructed here.

ANACOSTIA, D. C.—The Anacostia road will probably be equipped with electricity. The Potomac Light and Power Company is now negotiating with the former company to furnish the road with power for an electric line.

OSHKOSH, WIS.—A stock company will be organized, with Leander Choate, Thomas Wall, William Dichmann, Arthur Kellogg and John Martin as incorporators, to build an electric railway to connect Oshkosh with Berlin. Capital stock will be between $300,000 and $400,000.

BELLAIRE, OHIO. — An electric railway is to be constructed from Martin's Ferry to Colerain, Ohio. A company will be formed, with a capital stock of $50,000, to construct same.

SANTA BARBARA, CAL.—The Santa Barbara Consolidated Electric Company is constructing an electric line.

SYRACUSE, N. Y.—The East End suburbanites have asked for a franchise to construct an electric road from Syracuse to Manlius.

PLAINWELL, MICH.—The Cheboygan Street Railway Company contemplate the construction of an electric line to Mullet Lake.

BALLSTON SPA, N. Y.—A. B. Paine has been granted permission to construct an electric road in Milton.

OTTAWA, ILL.—An electric street railway company is being formed. The capital stock will be $25,000.

COVINGTON, KY.—An electric road is to be constructed from Covington to Crescent Springs.

LA FAYETTE, IND.—The La Fayette Street Railway Company has just decided on the improvements to be made in the plant here. Fifteen thousand dollars are to be expended at once on the power house at the foot of South street, a new engine, dynamo and boiler going in, all of the latest and most highly improved patterns.

BROOKLYN, N. Y.—The Brooklyn Wharf and Warehouse Company has ordered the construction of an electric railroad from Fulton street to Atlantic avenue. Eventually the company will have an electric line along the whole water front.

PITTSBURGH, PA.—The Second Avenue Traction Company is perfecting arrangements to connect McKeesport with Pittsburgh, *via* Brinton Station, thus completing a belt line beginning and ending at Fourth avenue and Market street, Pittsburgh.

OSWEGO, N. Y.—The Oswego Street Railway Company has purchased the old Shenandoah mill property, situated just north of the Mohawk mills on the Oswego Canal, and will erect on the site a modern power house for the operation of the road.

INDIANAPOLIS, IND. — Geo. H. Earle, Jr., William F. Harrity and R. W. Clay, of Philadelphia, have secured control of the local street railway lines. Thos. H. McLean, it is said, will be made president.

LONG ISLAND CITY, N. Y.—The stockholders of the Steinway Railway Company, of Long Island City, have decided to remove their electric railway plant to Woodside. Work will be commenced on the erection of a new $75,000 structure on March 1.

Electric Light and Power.

FAIRFIELD, ME.—The Waterville & Fairfield Railway and Light Company will in the early Spring enlarge its power house and doubly equip the plant by placing three powerful Hercules wheels in position so as to enable the company to furnish low-price power for all manufacturing purposes.

OSWEGO, N. Y.—The Oswego Street Railway Company will soon erect a power house.

DETROIT, MICH. — The Michigan Carbon Works contemplate putting in four more 125-horse-power boilers in their plant, which will make the total capacity 2,000 horse-power. Other improvements, which will be made next Spring, will entail an expenditure of about $100,000.

PORTLAND, MICH.—Steps are being taken to establish an electric light plant.

GRAND RAPIDS, MICH. — The Lowell Electric Light and Power Company, of Lowell, has constructed an electric light system in Grand Rapids.

SANTA CRUZ, CAL.—A franchise has been granted to F. W. Swanton for an electric light and power plant to be operated by the waters of Big Creek.

HENDERSON, KY.—The contract to build the electric light power house was let recently by the City Council at the sum of $6,000.

BERKELEY, CAL.—The Berkeley Electric Lighting Company is about to purchase a lot and commence the erection of a new brick building. The stockholders have decided to bond the company for $30,000.

RICHFIELD SPRINGS, N. Y.—The electric light and power plant at this place was destroyed by fire.

DEWITT, IOWA—The DeWitt Electric Light and Power Company has been incorporated. The capital stock is $6,000 and the company is to continue 20 years. Prominent citizens are backing the scheme.

APPLETON, WIS.—Appleton Electric Light and Power Company has been incorporated; capital, $50,000. Incorporators, A. L. Smith, Lyman E. Barnes, John M. Baer and others.

NEW YORK, N. Y.—Advance Gas and Improvement Company has been incorporated by James Kitchen and C. B. Kitchen, of Brooklyn; L. L. Benedict, H. W. Baldwin and James Irvine, of New York, to build electric light and gas plants, etc. Capital stock, $5,000,000.

MINNEAPOLIS, MINN. — Bicycle Electric Light Company has been incorporated by W. H. Brown, Aug. Perrault, John Theis. Capital stock, $35,000.

BUTTE, MONT.—Montana Electro-Gas Company has been incorporated by Thomas T. Baker, Rod D. Leggatt, James H. Monteath, John F. Forbis, of Butte; Theodore J. Lynde and others, to manufacture and sell calcium carbide and liquefied acetylene gas. Capital stock, $250,000.

New Telephone and Telegraph Companies.

ELM HALL, MICH.—The business men of this place and Riverdale have organized a company and put up a telephone line between these places. Elm Hall and Summer have also been connected by telephone.

NEW HAVEN, CT.—The People's Telephone Company has been organized; capital, $2,500. The subscribers are: George W. Coy, of Milford; Joseph Sheldon, J. J. Rogers and James R. Bolton, of New Haven.

POTTSVILLE, PA.—Prison Warden Brower has asked the county commissioners to place a telephone in the office of the jail, as it is badly needed.

EAGLE GROVE, IOWA—A 15-year franchise has been granted to the Eagle Grove Telephone Company to construct and operate a telephone exchange. Work will be commenced as soon as the weather will permit.

ALPENA, MICH.—The Mutual Telephone Company has been recently organized for the purpose of connecting the Soo, Detroit, Bay City, Saginaw, Alpena, St. Ignace, Cheboygan and other cities en route by long-distance telephones. It is contemplated to have the line in operation early in the Summer.

MERCER, PA.—The Mercer Telephone and Telegraph Company has been organized. G. W. Wright was elected president; H. H. Zeigler, secretary, and John I. Gordon, treasurer. A charter will be applied for and circuits will be established throughout the various counties of the State.

GRAND FORKS, MINN.—J. S. Buston will construct a long-distance telephone line from this place to Park River *via* Grafton. At Grafton 38 subscribers have been secured. Rates will be $2.50 per month for business houses and $2 for residences.

Increase of Capital Stock.

ST. LOUIS, MO.—The Fourth Street & Arsenal Railway Company filed notice of an increase of capital stock from $150,000 to $300,000.

DULUTH, MINN.—The Commercial Light and Power Company has increased its capital stock to $1,000,000.

JOLIET, ILL.—The Carpentersville, Elgin & Aurora electric road has increased its capital stock from $50,000 to $150,000.

New Manufacturing Companies.

NEW YORK, N. Y.—The Fuchs Dry Cell Battery Company has been incorporated; capital stock, $100,000. Directors, H. J. Katz, J. V. Falvey, Arthur Barrington and T. T. Ryan, New York; C. D. Yearance, of Brooklyn.

MANCHESTER, N. H.—The National Electrical Heating Company has been incorporated with $500,000 capital.

Business Troubles.

YPSILANTI, MICH.—The Ann Arbor-Ypsilanti motor line has gone into the hands of a receiver. The bonds and accrued interest amount to $46,000. William E. Parker was appointed receiver.

Entertained in New Orleans.

Colonel A. W. Crandall, president of the Great Southern Telephone and Telegraph Company, of New Orleans, entertained Mr. W. J. Arkell, the owner of *Judge* and *Leslie's Weekly*, and party, of New York, at the Boston Club in New Orleans during the recent Mardi Gras festivities. Col. Crandall is not only one of the prominent telephone men of the country, but takes quite an interest in politics, serving for two terms as chairman of the State Democratic Committee. Mr. Arkell and accompanying friends enjoyed several pleasant luncheons with Col. Crandall at the Club. On the evening of his departure Mr. Arkell gave a highly enjoyable and elaborate dinner in his private car. There were present Col. Crandall, Major Davis, editor of the New Orleans *Picayune;* Mr. H. M. Mayo, of the New Orleans *Times-Democrat*, and the gentlemen composing the party, consisting of Messrs. John A. Sleicher, Chas. W. Price, James B. Brady, L. H. Arnold, Bartlett Arkell, W. H. Maguire and Dr. J. B. Cosby, of New York, and Mr. A. G. Richmond, of Canajoharie.

The visitors left New Orleans with many pleasant reminders of the hospitality of the city, letters of introduction from Mr. H. M. Littell, a former resident, now president of the Atlantic Avenue Street Railway Company, of Brooklyn, adding greatly to their comfort and the attention received. On the return a visit was paid to the Belle Meade stock farm at Nashville, Tenn., where Gen. Jackson, the street railway magnate of that city, who, with Richard Croker, of New York, owns the famous farm and stock, extended every courtesy.

HEAT FROM ELECTRICITY.

BY J. E. TALBOT.

(*Concluded from page 106.*)

In this connection, moreover, the question of cost of current presents itself as a matter distinct from the rates charged by a supply company, which has necessarily to charge a profit above and beyond the actual cost of production. In the case of isolated plants, especially those of some magnitude, the expenses of administration, inspection and extensive canalization are practically absent, and current could often be obtained at a less cost than from a company supplying it as a commercial enterprise. The heating of electric cars presents a field for electric power immediately available and eminently suitable. The degree of warmth can be much more readily regulated than with the coal stove, and, of course, the heat is much more evenly distributed. Where a coal stove is employed the passengers in its immediate neighborhood are half roasted, while those near the doors shiver. With electric heaters the greatest heating effects are produced near the doors. In a recent installation two large heaters were placed at each end of a car on opposite sides, four other similar ones at points somewhat nearer the middle, and four others of smaller capacity about the middle. These heaters are arranged in three circuits, two circuits furnishing current to four large heaters each and the third supplying the four small heaters, the total current required for maximum effect being 14 amperes at 500 volts or 7,000 watts. This at five cents per kilowatt hour (a liberal figure for actual *cost*) would cost 35 cents an hour, which, it is claimed, will keep the car at an agreeable temperature in the coldest weather, much less current usually sufficing.

In another case a smaller car was heated to a moderate temperature by the expenditure of only about one-third of that energy from a temperature of about zero.

The heating of rooms is a matter upon which quantitative data are, if not entirely absent, yet conflicting, and governed by so many different elements that it is, as previously indicated, almost impossible to say what amount of energy can be definitely predicated as necessary to heat a given number of cubic feet. The number of thermal units to be supplied depends upon the nature and location of the building, the means of ventilation, the character and occupation of the inmates and other considerations. Authorities on heating and ventilation differ among themselves, and such rules as exist are largely of an empirical nature. In a given case, however, after consideration of the conditions, an architect or engineer can decide with some degree of approximation the number of thermal units to be supplied. Then, assuming the thermal unit at 772 foot pounds and the kilowatt hour at 2,656,400 foot pounds, we have 3,440 thermal units per kilowatt hour, the number required, and consequent cost being thence easily deducible.

An example of successful electric theater-heating is furnished by the Vaudeville Theater in London. This installation was originally undertaken as a temporary expedient, but proved so successful that it has been made permanent. Radiators of two sizes are employed, the larger ones requiring 12 amperes each, the smaller 3 amperes each. The current (90 amperes) at 100 volts is equivalent to 9 kilowatts per hour, the expense thus amounting to 72 cents per hour for warming the auditorium. The use of a theater being only intermittent, this appears to be a promising field, and churches would naturally come under the same category.

The construction of the apparatus employed is a matter of considerable interest, but can not be dealt with in detail here. As before indicated, the principle upon which all such apparatus is based is that the heat due to the passage of a current through a conductor offers considerable resistance to such passage. The heating effect is proportional to the square of the current multiplied by the resistance of the interposed medium. As, with a given electro-motive force (and the electro-motive force is invariably constant for heating purposes), the current is a function of the resistance; it is desirable within certain limitations to have the resistance per unit of mass as high as possible, consistent with the C^2R in the form of electric power furnishing the equivalent of the thermal units required when multiplied by the factor of time, or, in other words, to obtain the desired heat by raising a small mass to a considerable temperature rather than a large mass to a low temperature. A material is selected having high specific resistance and good radiating properties, and its resistance is usually further increased by its use in the form of a long, thin conductor in preference to a short, thick one.

Probably the ordinary rheostat, or other resistance of the earlier days of the electric art, consisting usually of coils of iron or German silver wire, was the prototype of the present electric heater. By accentuating the features which had caused the presence of heat as a more or less objectionable incident to the use of that apparatus, and modifying its construction to correspond with its new use, the heat element becomes the preponderating one, and now, instead of endeavoring to reduce the heating effects of the current, the reverse is aimed at. There are, however, limits to the degree of heat to which a body can be pushed, and this even short of actual fusion; thus iron, although its resistance is six or seven times that of copper, and although it is much cheaper than German silver, yet is restricted in its use from the fact that at temperatures not excessively high in this connection it oxidizes, and consequently deteriorates. Platinum, although of a resistance nearly equal to that of iron and capable of being raised to a high temperature without injury or fusion, is shut out by its high cost. Carbon, again, though it can be raised to a higher temperature even than platinum, can not be so raised in the presence of oxygen, its thermal emissivity is poor and the necessity for inclosing it in an exhausted chamber when very highly heated still further reduces radiation. German silver is a somewhat uncertain alloy and tends to become hard and brittle by use; it has in this country, at least, however, largely maintained its hold. In England, Mr. Crompton finds advantages in a nickel-steel alloy, the proportions of the composition of which can, of course, be varied, according to requirements. This is used in the form of a crimped or waved ribbon and imbedded in an enamel to prevent access of air. The flat form, instead of the cylindrical, evidently gives more radiating surface for a given cross section, and the embedding in cement permits of raising the heating medium to a higher point. This enameling of the resisting conductor has also been employed in this country by Carpenter, Cutter, Leonard and others. Mr. Leonard, in his form of apparatus for cooking and heating, emphasizes the idea of a small mass heated to a high degree and surrounded by material with which it can not combine chemically, as distinguished from the heating of a larger mass in which the heat is stored up. Probably Mr. Crompton is working on the same principle, as the specific resistance of ferro-nickel in microhm-centimeters (as given by Hospitalier) is 78.3 compared with 20.76 for German silver. No doubt the manufacturers of these appliances will make further improvements in the efficiency of this apparatus, though even now it puts to shame that of any other heat-producing device.

A reduction in cost and efficiency of the apparatus, a reduction in the charge for energy when supplied by a central station, and co operation on the part of the public, will result in a large extension of the use of electric heat, and will help to advance the civilized world a step nearer to that time when the individual production of light, heat and power will be an almost forgotten reminiscence.

LITERARY.

All the founders of *McClure's Magazine* are recent graduates of Knox College, Galesburg, Illinois, and the editor, Mr. McClure, is a trustee of this college. They have undertaken to assist the college in establishing "The Abraham Lincoln School of Science and Practical Arts," as a worthy memorial to Abraham Lincoln. The publishers of *McClure's Magazine* have established 100 scholarships in this new school. Each scholarship entitles the holder to all the privileges of Knox College, and can be earned by securing 500 subscribers to *McClure's Magazine*. A scholarship pays the board, room rent and tuition of any young man or woman for a year. The publishers of *McClure's Magazine* have also undertaken to raise an endowment fund of a quarter of a million dollars for this new department of Knox College.

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KINDRED INTERESTS

Huebel & Manger, the electrical specialty manufacturers, of Brooklyn, N. Y., speak most encouragingly for the outlook of the electrical supply field during the coming months.

The Electric Porcelain and Manufacturing Company at Trenton, N. J., say they are to increase their facilities fivefold for the manufacture of an improved form of porcelain which they claim is much tougher than anything now on the market.

The Baechtold & Parker Electric Company, which recently equipped shops at 79 and 81 Washington street, Brooklyn, for armature and commutator work, have just issued a catalogue of the American dynamo and lamp parts which they are manufacturing.

Since the Helios Electric Company moved into their new quarters on Callowhill street, Philadelphia, their output of arc lamps has more than doubled, and Mr. Frank S. Marr, the president of the company, recently remarked that even on the new basis the company had been greatly taxed to supply the orders of the past season.

The Stucky & Heck Electrical Manufacturing Company, of Newark, N. J., is doing an unusually heavy line of armature and commutator work this Winter. This company has one of the largest and most complete establishments for electrical work in New Jersey, and in the 18 years of their existence they have gained a substantial reputation for the construction of electrical machinery.

The Shawmut Fuse Wire Company, 43 Federal street, Boston, Mass., has issued its fifth annual catalogue, which contains a great deal of valuable information on fuses and fuse wires for every service. The company is now in new and enlarged quarters and is prepared to fill orders with promptness. Mr. Charles Garrison is treasurer and manager of the company, and Mr. H. P. Moore is superintendent.

The Standard Paint Company, 2 Liberty street, New York, the well known manufacturers of the better known "P. & B." goods, have accepted the agency for the United States and Canada of the celebrated "Ship" carbons, manufactured in Vienna by Messrs. Schiff, Jordan & Company. Electricians are already familiar with these well known carbons, they having been handled here for some little time by Mr. Frank S. De Ronde. While the business will be continued by the Standard Paint Company, Mr. De Ronde will give it his special attention and look after it as heretofore. The company have arranged to carry a very large stock of these goods in New York at all times so as to be prepared to make prompt shipments. The carbons are claimed to be of the very highest order, and give a steady, brilliant light at a minimum current without dust, noise or hissing. To convince the skeptical the importers will willingly send samples gratis on application. It will pay all those interested to at once correspond with the Standard Paint Company, who, up to April 15, will be at the old stand, 2 Liberty street; after that date they will occupy their new and larger quarters at 79 and 81 John street, necessitated by the steady and growing demand for the "P. & B." products.

Bi-metallic Wires.

The Bi-Metallic Electric Transmission Company has opened its office at No. 1204 Havemeyer Building, 26 Cortlandt street, New York, where it is prepared to quote prices, all sizes and in any quantity, on bi-metallic wire. The wire is composed of copper and steel—copper sheathing with steel core, combining conductivity, tensile strength and the "bi-metallic" effect. The wire, which is claimed to be perfect mechanically, is made for the Bi-Metallic Company by the John A. Roebling's Sons Company, of Trenton, N. J.

Two Large Arc Lamp Orders.

It is reported that the Marks-Ayer Electric Company, of New York city, closed a contract last week with Siegel, Cooper & Company for 1,000 inclosed arc lamps of their manufacture, to be installed in the new building now being erected on Sixth avenue, between Eighteenth and Nineteenth streets, New York city.

It was also reported that B. Altman & Company, a well known dry goods firm in New York, had purchased 400 arc lamps from the Clark Electric Company.

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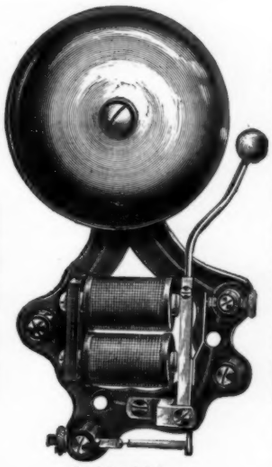
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ELECTRICAL PATENTS

ISSUED FEBRUARY 25, 1896.

555,068 Electric car-lighting apparatus; W. Biddle, Brooklyn, N. Y.—Consists of the field magnets and armature in a dynamo, a magnetic intercepter and means for moving the same endwise of the armature, in proportion to the speed of the armature, to intercept the lines of magnetism as the speed of the armature is increased or the reverse.

555,069 Thermostat actuated alarm; F. B. Bigelow, Auburn, Me.—Consists of a compound metallic bar having a flat part of sufficient length and breadth to serve as a base for the alarm, and two ends which bend upward at right angles to the base, together with an adjustable connection for the two ends which drop apart when the two ends are swung out by the unequal expansion of the bar.

555,073 Short-distance telephone communication; W. L. Bradshaw, Cincinnati, Ohio.

555,074 Electric transformer; W. Carter, Louisville, Ky.

555,075 Brake apparatus for railway vehicles; F. Chapsal, Paris, France.

555,076 Electric visual indicator; F. W. Cole, Newton, Mass.

555,090 Secondary electric clock; F. L. Gregory, Chicago, Ill.

555,101 Electric annunciator; J. Kips, Yonkers, N. Y. — Consists of a drop, a spring having a catch at its free extremity, an insulated stud, a taut wire extended from said stud to the spring, a bar pivoted suitably and arranged to arrest by contact the descent of the drop, a battery, a wire from one pole which connects with the taut wire, while that from its opposite pole connects with the drop to actuate a signal when the drop comes in contact with the bar.

555,112 Hanger board for arc lamps. 555,113 Scenic theater apparatus for producing sun effect; A. J. Oehring, Chicago, Ill.—Consists of a stage, a pivoted arm situated to the rear and to one side of the proscenium opening, and carrying lamps upon its end, a horizontally-traveling lamp carriage above the proscenium opening, a pivoted arm situated upon the opposite side of the stage to the rear and to one side of the proscenium opening, and carrying lamps upon the end thereof, and means for rotating said pivoted arms, advancing said carriage and lighting and extinguishing the lamps.

555,114 Circuit-controlling apparatus for scenic theaters; A. J. Oehring, Chicago, Ill — Consists of a continuously-rotating drum carrying lugs or projections upon its surface, two pairs of contacts adapted to be close together by said lugs, an electro-magnet in circuit with each of said pairs of contacts, a clutch controlled by said electro-magnets, and the traveling contact of a rheostat controlled by said clutch.

555,120 Electrical annunciator; E. Porath, Appleton, Wis.

555,130 Electric welding indicator; E. Thomson, Lynn, Mass.—Consists of a transformer, a counter secured to the secondary bar or circuit of such transformer, and means for actuating or controlling such counter by the current flowing in the bar.

555,131 Electric riveting. 555,191 Electric motor; E. Thomson, Swampscott, Mass.—An electric motor consisting of a divided armature core, two field-magnets acting respectively upon the two parts of the divided armature, and means for varying or changing the relative effects of said field magnets in proper manner to restore the speed to normal.

555,136 Electric elevator controller; E. P. Warner, Chicago, Ill.—Consists of a connecting rod adapted to be moved in one direction by said cam and an adjustable dash-pot adapted to regulate the rate of movement of said connecting rod in the other direction.

555,152 Constant potential alternating generator; W. K. Freeman, Fort Wayne, Ind.

555,154 Telephone transmitter; A. Gragam, London, Eng.—Consists of the body of insulating material carrying the stationary electrode, a terminating knob and cover and a circuit controller composed of a plunger passing through said knob and a circuit-closing spring with which the plunger engages.

555,160 Electric call and alarm apparatus; P. Hartfuss, Merzig, Ger.

555,165 Telegraphic repeater; L. Horton, Jr., Reading, Pa.

555,167 Electric railway signal system; J. Irwin, Omaha, Neb.

555,190 Alternating motor; N. Tesla, New York, N. Y.—Consists of an alternating coil or conductor and a closed-circuit conductor in inductive relation thereto, an armature mounted so as to be within the field produced by the coil and closed conductor.

555,192 Electric lighting system; S. L. Trippe, New York, N. Y.

555,199 Spark arrester for arc lamps; C. Winston, Memphis, Tenn.—Consists of two hinged, semi-cylindrical-shaped sections, angular boxes or supplemental sections arranged on the top of the main sections, and resilient doors or strips arranged in the main and supplemental sections and having their outer edges rigidly secured and their inner edges free and adapted to bear upon the carbon and form a double guard to prevent the escape of sparks and exclude insects.

555,208 Conduit electric railway; C. M. Bridges, Seattle, Wash.

555,216 Armature winding; W. H. Knight, Schenectady, N. Y.—An armature coil for a dynamo electric machine or motor, composed of a six-sided figure, the two halves of which lie in different but parallel planes and are united by a portion radial to the circumference of the armature.

555,222 Railway telephone system; W. H. Nixon, Providence, R. I.

555,239 Telephone; M. Garl, Akron, Ohio.—Consists of a helical L-shaped spring, having attached to the free horizontal portion of said spring the diaphragm, said diaphragm being free to vibrate with the spring, an electrode and a receiver.

555,243 Photographic retoucher; D. M. Harshmann, Chicago, Ill.

555,248 Electric railway; W. H. Jordan, Brooklyn, N. Y.

555,259 Electric heater; J. F. McElroy, Albany, N. Y.

555,263 Contact device for electrically-propelled vehicles; E. B. Reichel, Germany.—Consists of a horizontally-extending frictional contact device and a central revoluble contact.

555,266 Underground conductor system for electric railways; C. T. Schweiger, Berlin, Ger.

555,286 Electrical measuring instrument; F. Alteneck, Germany.

555,291 System of control for electric motors; E. A. Sperry, Cleveland, Ohio.

555,297 Spark arrester; G. A. Anderson, Waynesborough, Pa.—Consists of an outer case, a bundle of corrugated plates arranged vertically in the said case and having vertical zigzag passages between the plates.

555,301 Regulating electric distribution system; J. Burke, Schenectady, N. Y.

555,303 555,304 Primary battery; W. A. Crowdus, Chicago, Ill.—A negative element for primary batteries, consisting of a wire mesh supporting conducting plate, provided with a porous coating of baked copper oxide and a binder of resinous oil.

555,305 Electric lamp for vehicles; W. A. Crowdus, Chicago, Ill.

555,313 Electric clock; S. Fischer, Brooklyn, N. Y.

555,326 Electric distribution system; E. C. Myrick, Providence, R. I.

555,332 Electric receptacle for flashing powder in flash-light burner; H. E. Rathbun, Pawtucket, R. I.—A cartridge provided in itself with an electric wire adapted to ignite a charge of flashing powder placed in the cartridge and with means for attaching to the electric circuit connections.

555,381 Brush for dynamo electric machines and motors; F. W. Kreinberg, Elsey, Ger.—A brush formed of a bundle of fine wires braided together and saturated with a lubricant and a casing inclosing the wires and lubricant.

555,392 Electric motor for street cars; M. Neer, Springfield, Ohio.

555,403 Machine for connecting electric conductors; H. J. Savory, Somerville, Mass.

555,440 Illuminated sign for electrically-driven street cars; R. H. Engle, Garden Lake, N. Y.

555,470 Sectional conductor for electric railways; W. H. Baker, Pawtucket, R. I.

A New Electrical Manufacturing Company.

The Birdsall Electric Manufacturing Company, with offices at 231 Broadway, New York, has been incorporated at New Rochelle, N. Y., with a capital stock of $10,000. The incorporators are: Theodore Birdsall, Boyce Mars and Samuel R. Johnson. The company is manufacturing electric slot machines, electric clocks and a line of ornamental electric novelties.

McKenney & Waterbury.

The well known electric light and gas fixture house of McKenney & Waterbury, 181 Franklin street, Boston, Mass., is securing the cream of the fixture trade in New England. It is the largest house in that territory and has built up an immense trade on the merits and artistic designs of its goods, coupled with intelligent and progressive business methods.

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REFERENCES: "Electrical Review," New York; Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.

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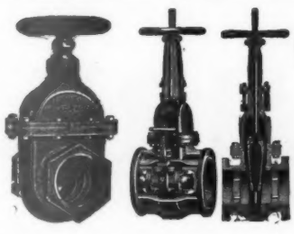

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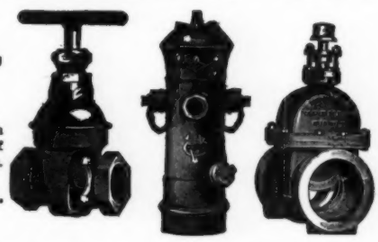

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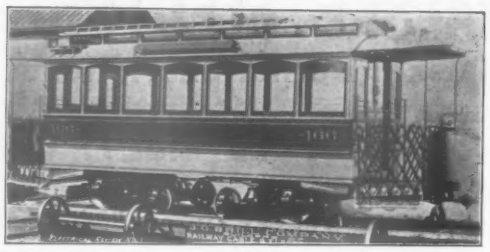

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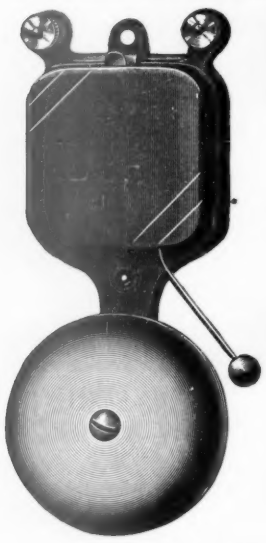

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